Draft
Environmental Impact Statement

For
Martinsdale Wind Farm LLC,
Horizon Wind Energy

February 2009

Montana Department of Natural Resources and Conservation
Northeastern Land Office
613 Northeast Main Street
Lewistown, MT 59457-1021

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

Trust Land Management Division

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Dear Sir / Madam

The Montana Department of Natural Resources and Conservation (DNRC) presents for your consideration a draft environmental impact statement for a wind energy park proposed by Martinsdale Windfarm LLC for construction on state school trust and private lands five miles northeast of the Town of Martinsdale. This analysis is conducted under the provisions of the Montana Environmental Policy Act. A 300 megawatt wind energy park is proposed for construction in phases on private land owned by the Martinsdale Hutterite Colony and adjoining state school trust land. The first phase would entail construction of a 59 megawatt facility as early as 2010.

Proposed are three alternative courses of action. Alternative A, the preferred alternative, analyses the environmental effects of construction of the wind farm on state and private lands, Alternative B analyses the effects of granting only easements for roads and power lines to cross state land in order to facilitate windfarm construction entirely on private land, the No Action alternative is an analysis of construction of the windfarm on private land with no use of state land.

The DNRC has no authority to make any decision regarding the use of private lands that can be done independent of the use of state school trust lands. Thus, the decision before DNRC is whether to include state school trust land in the windfarm project area either as part of the wind turbine network and/or through the granting of easement for road and power access to facilitate windfarm construction on private land.

The public is invited to submit written comments regarding the proposal. Comments will be accepted until Friday, March 13, 2009. Please submit comments to the following address:

Montanan Department of Natural Resources and Conservation
Northeastern Land Office
Martinsdale Windfarm
P.O. Box 1021
Lewistown, MT 59457

Or email comments to MartinsdaleWindFarm@mt.gov.

Questions regarding this draft environmental analysis may be directed to Clive Rooney at the DNRC at 538-7789.

COVER SHEET

The Montana Department of Natural Resources and Conservation has prepared this Environmental Impact Statement to examine the effects on the human environment of the construction and operation of a wind farm in Wheatland and Meagher counties, Montana.

Proposed Action: The Montana Department of Natural Resources and Conservation (DNRC), proposes to lease approximately 3,080 acres of school trust land and allow wind turbines, for the production of electrical energy, on 13.51 acres. Seven to 15 wind turbines and 3.1 miles of access roads are proposed to be constructed on school trust land located at:

Township 9 North, Range 11 East, P.M.M., Wheatland County,
Section 24: E½ NE¼ and E½ SE¼

Township 9 North, Range 12 East, P.M.M., Wheatland County,
Section 16: All
Section 18: SW¼
Section 20: NW¼, SW¼, N½ NE¼, NW¼ SE¼, S ½ SE¼
Section 28: S ½ NW¼, SW¼, S½ SE¼
Section 30: All
Section 32: All

as part of a larger wind energy development occurring on adjacent private land. The project is located approximately 20 miles west of the town of Harlowton along US highway 12. The proposed action could be implemented as early as 2009.

Type of document: Environmental Impact Statement

Lead agency: Montana Department of Natural Resources and Conservation

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Executive Summary

S.1 Introduction

This document is the summary of the draft Environmental Impact Statement (EIS) for the Martinsdale wind farm project required by the Montana Environmental Policy Act (MEPA), Title 75, Chapter 1, Montana Code Annotated (MCA).

The Montana Department of Natural Resources (DNRC) is considering a Martinsdale Wind Farm LLC proposal to build, maintain, and generate power from a wind energy facility with up to 300 megawatts (MW) of installed capacity known as the Martinsdale Wind Power Project (project). The project would be located in central Montana approximately 20 miles west of Harlowton, Montana (**Figure S-1**). The DNRC conducted a competitive bid process to award a lease for wind development rights for the state's land on the project site. Horizon Wind Energy (Horizon) was awarded the lease.

Martinsdale Wind Farm LLC is a subsidiary of Horizon which is owned by EDP Renováveis, S.A. of Portugal. Horizon is based in Houston, Texas and has regional offices in Portland, Oregon and Ellensburg, Washington.

The project is planned to be constructed in two phases because the currently available transmission capacity on the Two Dot to Great Falls transmission line limits the project to approximately 58 MW. The EIS analyzes the impacts of the full build out of the project. The EIS does not analyze transmission of energy produced in excess of 58 MW as the type and location of transmission line development is unknown at this time.

Phase I would consist of 27 wind turbine generators and have a capacity of approximately 58 MW. The project's major components would include an underground and overhead 34.5 kilovolt (kV) electrical collection system, a project step-up and interconnect substation, a Supervisory Control and Data Acquisition (SCDA) communication system, hub height free-standing meteorological towers, transmission lines, access roads, turbines, foundations, grid interconnection facilities, an operations and maintenance (O&M) center, and associated supporting infrastructure and facilities.

Phase I of the project would connect directly to NorthWestern Energy's 100-kV Two Dot to Great Falls transmission line that crosses the project site. It is anticipated that construction of Phase I could start as early as spring 2009.

Figure S-1

The building of Phase II is dependent on the availability of additional transmission capacity. It is expected that Phase II would expand the project to an estimated total capacity of 300 MW. Phase II would add 58 to 115 wind turbines depending on the type and capacity of wind turbines selected. For the purpose of analyzing the potential impacts of this project, it is assumed that Phase II would add 99 additional 2.1 MW wind turbine generators.

It would be possible for Martinsdale Wind Farm LLC to construct the entire project (Phase I and II) on the 15,557 acres of private land already under Martinsdale Wind Farm LLC's control, use available transmission capacity, and not require a permit from DNRC. Because Martinsdale Wind Farm LLC is proposing to lease 3,080 acres of state-owned land, DNRC is required by state law to analyze the potential environmental impacts associated with wind farm development.

S.2 Purpose and Need for State Action

The state land involved in the proposed project is held by the State of Montana in trust for the support of the Common School Trust (K-12 public education). The Board of Land Commissioners and the DNRC are required by the Montana Constitution to manage trust land to produce the largest measure of reasonable and legitimate monetary advantage for Montana's public school system. This guiding philosophy was codified by the Montana Legislature in 77-1-601, MCA which states:

> *It is in the best interest and to the great advantage of the state of Montana to seek the highest development of state-owned lands in order that they might be placed to their highest and best use and thereby derive greater revenue for the support of the common schools, the university system, and other institutions benefiting therefrom, and that in so doing the economy of the local community as well as the state is benefited as a result of the impact of such development.*

In order to meet its Constitutional and statutory obligations, the DNRC has set the following project objectives:

> Objective #1**:** Lease the right to use state land for the production of wind energy and generate the maximum sustainable monetary return to the common school trust.
>
> Objective #2: Manage the rangeland for the desired future condition characterized by healthy native plant and wildlife communities.

In order to fulfill statutory obligations, the DNRC must make the following determinations:

- Determine if alternatives meet the project objectives
- Determine which alternative should be selected
- Determine if the selected alternative would cause significant effect(s) to the human environment.

This proposal would be in compliance with the agency's real estate management plan and the Wheatland County Right to Farm and Ranch Ordinance. The five counties along the Musselshell River (Meagher, Wheatland, Golden Valley, Musselshell and Petroleum) are working on a wind farm development policy to guide wind energy development along the river valley. They do not anticipate completing the policy until spring or summer 2009.

S.3 Benefit to the State

Under the No Action alternative 99 turbines would be erected on 15,557 acres of private land. There would be no wind turbines, new roads, or power lines on state land and no additional decisions by DNRC. Alternative A, the Proposed Action, would have 126 turbines on private land and 7 to 15 wind turbines, new roads, and power lines on state land. Alternative B would have 119 turbines on private land and no wind turbines on state land. However, there would be easements for underground power lines and new roads on state land. Under Alternative A, DNRC could require as lease agreement contractual stipulations the mitigation and monitoring measures listed in **Appendix C and D** for facilities located on state land. Under the No Action alternative and Alternative B, the DNRC has no authority to mandate mitigation and monitoring measures on private land. Martinsdale Windfarm LLC has indicated that it is their intention to implement these measures on a voluntary basis.

Table S-1 shows how the alternatives would fulfill the DNRC objectives and the financial benefits to the state from leasing the land for wind power production.

TABLE S-1
SUMMARY COMPARISON OF PREDICTED ACHIEVEMENT OF PROJECT OBJECTIVES

	Indicators	No Action	Alt A	Alt B
Objective 1: Lease the right to use state land for the production of wind energy and generate the maximum legitimate monetary return to the common school trust.	Annual income to the common school trust	No income from wind energy. Continued annual income of approximately $5,961 from grazing ($6.94/AUM) and $11,205 from agricultural use ($15/acre).	Assuming ½ the turbines would be on grazing land and ½ on agricultural land – income of approximately $5,923 from grazing and $10,875 from agricultural use. The lease of state land for wind energy will produce the greater of: $2,500 minimum per megawatt generated on state land or 3% of the gross revenue generated by wind turbines (Years 1-10). School trust revenue is projected to be between $36,750 and $42,913 annually for seven turbines. The exact revenue is not known at this time. Completion of a power purchase agreement will determine the exact number of turbines that will be constructed on state land and the market price per megawatt.	Additional income from easements on 13.04 acres of state land for roads and power lines of approximately $5,216.

TABLE S-1 (Cont.)
SUMMARY COMPARISON OF PREDICTED ACHIEVEMENT OF PROJECT OBJECTIVES

	Indicators	No Action	Alt A	Alt B
Objective 2: Manage the state rangeland for the desired future condition characterized by a healthy native plant and animal community	Plant species composition and vigor	Plant species composition would be unchanged.	13.01 to 22.46 acres of grazing land would be permanently disturbed. Plant species and vigor on over 99% of the state land would remain unchanged.	10.01 acres of grazing land would be permanently disturbed. Plant species and vigor on over 99% of the state land would remain unchanged.
	Livestock carrying capacity	State Land Animal Unit Month (AUM) Carrying Capacity of approximately 858 would remain unchanged.	A reduction of approximately 3 to 6 AUM.	A reduction of approximately 2.5 AUM.
	Healthy wildlife populations	Wildlife includes pronghorn, mule deer, small mammals, grassland songbirds, raptors, such as red-tailed hawks, golden eagles and northern harriers.	A minor impact to mammal populations would occur during project construction. Some mortality of birds and bats is expected from the project and this would be monitored.	A minor impact to mammal populations would occur during project construction. Some mortality of birds and bats is expected from the project and this would be monitored.

S.4 MEPA Process

MEPA, Title 75, Chapter 1, MCA, requires scoping in the early stages of developing an EIS. Scoping is a process to determine the scope and significance of issues related to a proposed action, in this case, the leasing of state land for a portion of a proposed wind farm. Knowing the scope and significance of issues allows for development of reasonable alternatives, and an accurate and timely environmental analysis. In addition, scoping helps identify issues important to the management of public land and resources in the area, as well as issues to be examined in the planning process. The scoping process is designed to encourage public participation and to solicit public input.

Scoping is an essential step to ensure that all issues are brought to the table. Issues raised during scoping guide development of alternatives that are evaluated in the EIS. Scoping also provides an opportunity to inform the general public about the management of public land and for DNRC to gauge the concerns of those who have a stake in decisions about managing the resources.

The scoping period began on January 17, 2008, with the publication of the scoping meeting notices, and closed on March 4, 2008.

The DNRC hosted an open house and public scoping meeting to present the proposal and explain the state permitting processes on Tuesday, January 29, 2008 at the Harlowton Youth Center, 201 Third Avenue, Harlowton, MT. The meeting ran from 3:00 PM to 7:00 PM. DNRC representative Clive Rooney made three identical presentations. After each presentation, there was an open house where DNRC and Martinsdale Wind Farm LLC specialists staffed information stations and were available to answer questions.

A press release announcing the public scoping meeting was published in the following newspapers:

- Meagher County News Thursday, January 17, 2008
- The Times Clarion Thursday, January 17, 2008
- Great Falls Tribune Thursday, January 17, 2008
- Billings Gazette Thursday, January 17, 2008

Notice of the meeting was mailed to adjacent land owners. An additional letter and email were sent to adjacent landowners soliciting comments on the proposal. Attendance was recorded using sign-in sheets at the registration station. Sixty-five people signed the sign-in sheets. During the scoping meeting, participants asked questions, expressed concerns, and made suggestions.

Issues Identified During Scoping and Studied in Detail

Soil Resources

Potential adverse impacts to soil include increased runoff due to compaction and loss of vegetation for wildlife and livestock.

Land Use and Vegetation

Construction and operation of the wind farm would change land use in the area. The DNRC would have to reclassify the state land from a primary land use of agricultural and grazing to a primary land use of wind energy production. The reclassification may affect the existing state grazing lessee.

Potential adverse impacts to vegetation include limited surface disturbance of native range for access roads and turbine installation.

Wildlife

Potential adverse impacts to birds and bats includes the displacement of local birds from construction and operation of the wind farm, and resident and migratory bird and bat deaths from collisions with wind turbines and associated facilities and bat deaths from barometric trauma. Some mortality of small mammals may occur from construction and operation due to excavation and vehicle collisions.

Visual Resources

Wind turbines and associated facilities change the visual character of the area.

Noise

Wind turbines create noise that may be audible to area residents from some locations.

Aviation

Wind turbines may pose a risk to aircraft.

Economic Benefits and Expected Revenues

Construction and operation of a wind farm will create employment and tax revenue.

Historical and Archeological Sites

Construction and operation of the wind farm may disturb historical or cultural resources.

Issues Eliminated from Further Study

Water Quantity, Quality and Distribution

Only one perennial stream, Daisy Dean Creek, is in the project area. It is anticipated that an individual permit under Section 404 of the Clean Water Act is not required.

The DEQ will require a General Storm Water Discharge permit that includes preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is typically completed shortly before project construction after completion of the final engineering design of the wind farm. It will contain an analysis of the characteristics of the site such as nearby surface water, topography, and storm water runoff patterns; identification of potential pollutants such as sediment from disturbed areas, and stored wastes or fuels; and identify Best Management Practices (BMPs) that will be used to minimize or eliminate the potential for these pollutants to reach surface waters through storm water runoff.

Martinsdale Wind Farm LLC has developed BMPs for wind farm construction that establish erosion and sediment control measures that mitigate potential effects to water quality, quantity, and distribution.

Because of the absence of valuable surface water features, the requirements of the DEQ storm water permitting process, and compliance with BMPs, project construction or operation is unlikely to have a negative effect on water quantity, quality, or distribution. Therefore, no direct, indirect, or cumulative effects are likely from the selection of any alternative and this resource has been eliminated from further analysis.

Air Quality

Wind turbines do not produce polluting emissions. BMPs will mitigate any expected effect from fugitive dust to below federal or state standards. Therefore, no direct, indirect, or cumulative effects are likely from the selection of any alternative and this resource has been eliminated from further analysis.

Recreational Use

Since recreational use would not change after construction of the wind farm, no direct, indirect, or cumulative effects are likely from the selection of any alternative and this resource has been eliminated from further analysis.

Public Safety

The Montana Department of Transportation highway approach permitting process and BMPs for wind farm construction mitigate any potential danger to public safety. Therefore, no direct, indirect, or cumulative effects are likely from selection of any alternative and this resource has been eliminated from further analysis.

Noxious weeds

The project area is relatively free of noxious weeds. Compliance with the Montana County Noxious Weed Management Act through submission of a weed control plan to the Wheatland and Meagher County Weed Boards and adherence to BMPs mitigate potential for the introduction or spread of noxious weeds to the project area. Therefore no direct, indirect, or cumulative effects are likely from selection of any alternative and this resource has been eliminated from further analysis.

S.5 Description of Alternatives

The No Action Alternative and two action alternatives were studied in detail. In most EISs, the No Action alternative means the project would not be built. In this EIS, the No Action alternative means the state does not have to take any action or make any decisions. If the No Action alternative were selected by the DNRC the project would still be built; but not on state land. Under the No Action alternative, the project could be built entirely on private land.

Two action alternatives are analyzed in this EIS. Under Alternative A, the state would lease state land for the construction of wind turbines, associated power lines and access roads. Under Alternative B, the DNRC would not allow construction of wind turbines on state land but would grant easements for power lines and roads to be built on state land. Because of the ability to access isolated parcels by traveling over state lands, Alternative B would enable the construction of 20 additional turbines on private land. If the state does not lease the state parcels for wind energy development or issue easements, Martinsdale Wind Farm LLC intends to build the wind farm entirely on private land with no use of state land (No Action alternative).

S.6 Affected Environment

The project would be located on approximately 18,637 acres: 15,557 acres of private land and 3,080 acres of state land, approximately 20 miles west of Harlowton, Montana in one of the windiest areas of central Montana north of the Crazy Mountains. The general area is characterized by rolling hills in a rural landscape of dry, rocky grasslands, areas of irrigated and dry land farming, grazing land and areas covered with a mixture of sagebrush, bitterbrush, and bunch grasses. Turbines would be placed on open ridge tops in the rolling hills above the Musselshell River, where strong northwest winds accelerate as they pass through the valley over the rolling hills. The overall population density in the area is very low with few dwellings in the vicinity of the project site. Land use in the area consists of ranching and farming on privately-owned land held by large landowners and state-owned property managed by DNRC.

S.7 Comparison of Alternatives and Impacts

Under the No Action alternative 99 turbines would be erected on 15,557 acres of private land. There would be no wind turbines, new roads, or power lines on state land and no additional decisions by DNRC. Alternative A, the Proposed Action, would have 126 turbines on private land and 7 to 15 wind turbines, new roads, and power lines on state land. Alternative B would have 119 turbines on private land and no wind turbines on state land. However, there would be easements for underground power lines and new roads on state land.

If Alternative A were chosen as the preferred alternative, DNRC would reclassify the state land in the project area from its primary purpose of livestock grazing to the land classification "other" that allows for a primary purpose of wind farm development. DNRC would withdraw the subject land from the existing grazing leases and issue the existing grazing lessee a grazing license that would allow existing grazing practices to continue subordinate to the dominate interest of the wind farm. DNRC would then enter into a lease agreement with Martinsdale Wind Farm LLC that would allow the construction and operation of wind turbines and associated facilities on state school trust land.

If Alternative B were chosen as the preferred alternative, DNRC would grant easements to Martinsdale Wind Farm LLC for underground power lines and access roads to cross state land.

S.8 The Agency Preferred Alternative

The DNRC has chosen Alternative A as the preferred alternative because Alternative A represents the best balance between avoidance of impacts and fulfillment of the DNRC's constitutionally and statutorily mandated objectives.

Table S-2 summarizes the expected impacts of the alternatives and provides a comparison of alternatives.

TABLE S-2
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Avian and bat mortality from collision with wind turbines and bat mortality from barometric trauma.	Approximately 4.62 or fewer bird and 13.4 or fewer bat deaths per turbine per year. With 99 turbines, up to 458 bird deaths and up to 1326 bat deaths could be expected per year. Most resident bird fatalities would be of common species such as horned lark and McCown's longspur with up to 14 raptor deaths per year. Monitoring will be conducted to estimate actual levels.	Approximately 4.62 or fewer bird and 13.4 or fewer bat deaths per turbine per year. With 126 turbines up to 582 bird deaths and up to1689 bat deaths could be expected per year. Most resident bird fatalities would be of common species such as horned lark and McCown's longspur with up to 18 raptor deaths per year. Monitoring will be conducted to estimate actual levels.	Approximately 4.62 or fewer bird and 13.4 or fewer bat deaths per turbine per year. With 119 turbines, up to 550 bird deaths and up to 1595 bat deaths could be expected per year. Most resident bird fatalities would be of common species such as horned lark and McCown's longspur with up to 17 raptor deaths per year. Monitoring will be conducted to estimate actual levels.
Avian displacement due to turbine proximity	Some small scale displacement of breeding songbirds is expected from project facilities.	Same as the No Action alternative.	Same as the No Action alternative.
Soil Resources	A minor amount of soil compaction and erosion will occur.	Same as the No Action alternative with slightly more area effected.	Same as the No Action alternative with slightly more area affected.

TABLE S-2 (Cont.)
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Vegetation and Land Use	Construction of the wind farm on private land would permanently alter 186 acres of grazing, agricultural and forest land. Temporary disturbances totaling 299 acres would be revegetated. Within the 18,637 acre wind farm area over 98% of existing vegetative cover would remain undisturbed or be revegetated.	Construction of the wind farm on all ownerships would permanently alter 228 acres of grazing, agricultural and forest land. Temporary disturbances totaling 375 acres would be revegetated. Within the 18,637 acre wind farm area over 98% of existing vegetative cover would remain undisturbed or be revegetated.	Construction of the wind farm on all ownerships would permanently alter 225 acres of grazing, agricultural and forest land. Temporary disturbances totaling 357 acres will be revegetated. Within the 18,637 acre wind farm area over 98% of existing vegetative cover would remain undisturbed or be revegetated.
	Some displacement of grazing and cropping activities would occur during the construction phase of wind farm development. Post construction, grazing, cropping, and wind energy production are expected to co-exist without conflict.	Some displacement of grazing and cropping activities would occur during the construction phase of wind farm development. Post construction, grazing, cropping, and wind energy production are expected to co-exist without conflict. DNRC would cancel the existing grazing leases and issue an adjusted grazing license to the existing grazing lessee. The predominant classification of the land would be for wind energy production. A small reduction in AUMs is expected as a result of this reclassification.	Some displacement of grazing and cropping activities would occur during the construction phase of wind farm development. Post construction, grazing, cropping, and wind energy production are expected to co-exist without conflict. DNRC would issue easements for roads on 10.01 acres and adjust grazing leases accordingly. A small reduction in AUMs is expected as a result of this reclassification.
Visual Impacts	Construction of the wind farm will introduce prominent new features to the visual character of the area. Whether this is a beneficial or detrimental impact is up to the individual observer.	Somewhat more than the No Action alternative because of the 27 additional turbines.	Somewhat more than the No Action alternative because of the 20 additional turbines.

TABLE S-2 (Cont.)
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Noise	The proposed project is located in a rural agricultural area. It is predicted that the wind turbines will produce approximately 35 A-weighted decibels at 0.5 mile. The baseline noise level in the area is approximately 35 to 45 dBA (L_{dn}). It is expected that wind speeds will mask the noise generated by the wind turbines at distances greater than 1,000 feet. There are no non-Colony noise receptors closer than 1 mile to any proposed turbine.	Somewhat more than the No Action alternative because of the 27 additional turbines.	Somewhat more than the No Action alternative because of the 20 additional turbines.
Economic benefits and expected revenue. (State tax is based on estimated equipment capital costs.)	Estimated state taxes up to $7,986,528 annually for 99 turbines. Meagher County turbines would generate $62,832 and Wheatland County turbines would generate $722,568 in annual property taxes. Estimated construction employment of up to 287. Estimated permanent operation employment up to 18.	Estimated state taxes up to $10,164,672 annually for 126 turbines. Meagher County turbines would generate $107,100 and Wheatland County turbines would generate $1,082,900 in annual property taxes. Estimated construction employment up to 434. Estimated permanent operation employment up to 27.	Estimated state taxes up to $9,599,968 annually for 119 turbines. Meagher County turbines would generate $84,966 and Wheatland County turbines would generate $859,101 in annual property taxes. Estimated construction employment up to 334. Estimated permanent operation employment up to 21.

TABLE S-2 (Cont.)
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Historical and archeological sites	There is no legal obligation to conduct historical or cultural resource inventories on private land. However, if any sites were discovered the State Historic Preservation Office would be notified and the site would be avoided, or properly documented.	A project-specific cultural resource inventory would be conducted on state land when proposed developments are finalized Much of the land has been previously disturbed through cultivation. If any historical or archeological sites are encountered below plow depth, construction would be halted until consultation with the State Historic Preservation Office is completed.	Same as the Alternative A and Alternative B.
Aviation	The wind farm will be located approximately 19 miles from the nearest airport at Harlowton and approximately 50 miles from the nearest commercial airport in Lewistown. It would not impact any airport operations. The Martinsdale area is within a defined aircraft flight path between Great Falls and Billings, but lighting on the turbines would mitigate any impacts to aviation.	Similar to the No Action alternative.	Similar to the No Action alternative.

1.0 Purpose Of and Need For Action

This document constitutes the draft Environmental Impact Statement (EIS) for the Martinsdale wind farm project required by the Montana Environmental Policy Act (MEPA), Title 75, Chapter 1, Montana Code Annotated (MCA)

1.1 Proposed Action

The Montana Department of Natural Resources (DNRC) is considering a Martinsdale Wind Farm LLC proposal to build, maintain, and generate power from a wind energy facility with up to 300 megawatts (MW) of installed capacity known as the Martinsdale Wind Power Project (project). The project would be located in central Montana approximately 20 miles west of Harlowton, Montana (**Figure 1.1-1**). Martinsdale Wind Farm LLC is a subsidiary of Horizon Wind Energy (Horizon) which is owned by EDP Renováveis, S.A. of Portugal. Horizon is based in Houston, Texas and has regional offices in Portland, Oregon and Ellensburg, Washington. The DNRC conducted a competitive bid process to award a lease for wind development rights for the state's land on the project site. Horizon was awarded the lease.

The project is planned to be constructed in two phases because the currently available transmission capacity on the Two Dot to Great Falls transmission line limits the project to approximately 58 MW. This EIS analyzes the impacts of the full build out of the project. This EIS does not analyze transmission of energy produced in excess of 58 MW as the type and location of transmission line development is unknown at this time.

Phase I would consist of 27 wind turbine generators and have a capacity of approximately 58 MW. The project's major components would include an underground and overhead 34.5 kilovolt (kV) electrical collection system, a project step-up and interconnect substation, a Supervisory Control and Data Acquisition (SCDA) communication system, hub height free-standing meteorological towers, transmission lines, access roads, turbines, foundations, grid interconnection facilities, an operations and maintenance (O&M) center, and associated supporting infrastructure and facilities. Phase I of the project would connect directly to NorthWestern Energy's 100-kV Two Dot to Great Falls transmission line that crosses the project site. It is anticipated that construction of Phase I could start as early as spring 2009.

The building of Phase II is dependent on the availability of additional transmission capacity. It is expected that Phase II would expand the project to an estimated total capacity of 300 MW. Phase II would add 58 to 115 wind turbines depending on the type and capacity of wind turbines selected. For the purpose of analyzing the potential impacts of this project, it is assumed that Phase II would add 99 additional 2.1 MW wind turbine generators.

Figure 1.1-1

It would be possible for Martinsdale Wind Farm LLC to construct the entire project (Phase I and II) on the 15,557 acres of private land already under Martinsdale Wind Farm LLC's control, use available transmission capacity, and not require a permit from DNRC. Because Martinsdale Wind Farm LLC is proposing to use state land, DNRC is required by state law to analyze the potential environmental impact associated with wind farm development.

1.2 Location

The project would be located on approximately 18,637 acres, composed of 15,557 acres of private land and 3,080 acres of state land, approximately 20 miles west of Harlowton, Montana in one of the windiest areas of central Montana north of the Crazy Mountains. The general area is characterized by rolling hills in a rural landscape of dry, rocky grasslands, areas of irrigated and dry land farming, grazing land and areas covered with a mixture of sagebrush, bitterbrush, and bunch grasses. Turbines would be placed on open ridge tops in the rolling hills above the Musselshell River, where strong northwest winds accelerate as they pass through the valley over the rolling hills. The overall population density in the area is very low with few dwellings in the vicinity of the project site. Land use in the area consists of ranching and farming on privately-owned land held by large landowners and state-owned property managed by DNRC.

1.3 Need for the Action

The state land involved in the proposed project is held by the State of Montana in trust for the support of the Common School Trust (K-12 public education). The Board of Land Commissioners and the DNRC are required by the Montana Constitution to manage trust land to produce the largest measure of reasonable and legitimate monetary advantage for Montana's public school system. This guiding philosophy was codified by the Montana Legislature in 77-1-601, MCA which states:

> *It is in the best interest and to the great advantage of the state of Montana to seek the highest development of state-owned lands in order that they might be placed to their highest and best use and thereby derive greater revenue for the support of the common schools, the university system, and other institutions benefiting therefrom, and that in so doing the economy of the local community as well as the state is benefited as a result of the impact of such development.*

1.4 Objectives of the Action (desired outcomes and conditions)

In order to meet its Constitutional and statutory obligations, the DNRC has set the following project objectives:

Objective #1**:** Lease the right to use state land for the production of wind energy and generate the maximum sustainable monetary return to the common school trust.

Objective #2: Manage the rangeland for the desired future condition characterized by healthy native plant and wildlife communities.

1.5 Decisions to be Made by DNRC

In order to fulfill statutory obligations, the DNRC must make the following determinations:

- Determine if alternatives meet the project objectives
- Determine which alternative should be selected
- Determine if the selected alternative would cause significant effect(s) to the human environment.

1.6 Relationship to Other Plans

The DNRC completed a programmatic EIS for real estate management activities in 2005. This proposal would be in compliance with the agency's real estate management plan. The five counties along the Musselshell River (Meagher, Wheatland, Golden Valley, Musselshell and Petroleum) are working on a wind farm development policy to guide wind energy development along the river valley. They do not anticipate completing the policy until spring or summer 2009. The proposal does not conflict with the Wheatland County's *A Right to Farm and Ranch Ordinance.*

1.7 History of Planning and Scoping Process

The Montana Environmental Policy Act (MEPA), Title 75, Chapter 1, MCA, requires scoping in the early stages of developing an EIS. Scoping is a process to determine the scope and significance of issues related to a proposed action, in this case, the leasing of state land for a portion of a proposed wind farm. Knowing the scope and significance of issues allows for development of reasonable alternatives, and an accurate and timely environmental analysis. In addition, scoping helps identify issues important to the

management of public land and resources in the area, as well as issues to be examined in the planning process. The scoping process is designed to encourage public participation and to solicit public input.

Scoping is an essential step to ensure that all issues are brought to the table. Issues raised during scoping guide development of alternatives that are evaluated in the EIS. Scoping also provides an opportunity to inform the general public about the management of public land and for DNRC to gauge the concerns of those who have a stake in decisions about managing the resources.

The scoping period began on January 17, 2008, with the publication of the scoping meeting notices, and closed on March 4, 2008.

The DNRC hosted an open house and public scoping meeting to present the proposal and explain the state permitting processes on Tuesday, January 29, 2008 at the Harlowton Youth Center, 201 Third Avenue, Harlowton, MT. The meeting ran from 3:00 PM to 7:00 PM. DNRC representative Clive Rooney made three identical presentations. After each presentation, there was an open house where DNRC and Martinsdale Wind Farm LLC specialists staffed information stations and were available to answer questions.

A press release announcing the public scoping meeting was published in the following newspapers:

- Meagher County News Thursday, January 17, 2008
- The Times Clarion Thursday, January 17, 2008
- Great Falls Tribune Thursday, January 17, 2008
- Billings Gazette Thursday, January 17, 2008

Notice of the meeting was mailed to adjacent land owners. An additional letter and e-mail were sent to adjacent landowners soliciting comments on the proposal. Attendance was recorded using sign-in sheets at the registration station. Sixty-five people signed the sign-in sheets. During the scoping meeting, participants asked questions, expressed concerns, and made suggestions.

The following agencies and organizations will receive copies of the draft EIS to elicit input into the review of this project:

Montana Department of Fish, Wildlife and Parks, T.O. Smith, Helena

Montana Department of Fish, Wildlife and Parks, Jay Newell, Roundup

Montana Department of Environmental Quality

Montana Department of Transportation
Montana Historical Society
Montana Department of Labor
Wheatland County Commission
Meagher County Commission
United States Fish and Wildlife Service
United States Army Corp of Engineers, Helena
United States Bureau of Land Management, Billings
United States Forest Service, District Ranger
United States Federal Aviation Administration
United States Natural Resource Conservation Service
United States Air Force
United States Federal Communication Commission
Lewistown Airport
Harlowton Airport
City of Harlowton
Montana Audubon
Linda Hickman, Wheatland/Meagher County Attorney
Montana Environmental Information Center
Town of Martinsdale

1.8 Other Evaluations Related to this Project

DNRC Environmental Assessment (EA) dated October 22, 2002: Placement of an anemometer to measure wind and weather conditions and authorize avian and geotechnical studies.

DNRC Field Evaluations of grazing management practices dated April 27, 2001 and May 12, 2003.

Cultural Resource Inventory project # 95-8-3; Cenex Front Range Pipeline class 3 level inventory of pipeline disturbance.

Cultural Resource Inventory project # 99-6-9; Montana Department of Highways class 3 level inventory of highway disturbance.

Judith Gap Wind Farm Project Environmental Analysis, July 21, 2004, Montana Department of Natural Resources and Conservation.

1.9 Permits, Licenses, and Other Authorizations Required

The following permits and plans will be submitted upon approval of this EIS.

Agency	Permit/Plan
Montana Department of Environmental Quality	Authorization under the General Permit for Stormwater Discharges from Construction Activity
Montana Department of Transportation	Approach Permit
Wheatland County Weed Board	Submission of a weed management plan
Meagher County Weed Board	Submission of a weed management plan

1.10 Issues Studied in Detail

1.10.1 Soil Resources

Potential adverse impacts to soil include increased runoff due to compaction and loss of vegetation for wildlife and livestock.

1.10.2 Land Use and Vegetation

Construction and operation of the wind farm would change land use in the area. The DNRC would have to reclassify the state land from a primary land use of agricultural and grazing to a primary land use of wind energy production. The reclassification may affect the existing state grazing lessee.

Potential adverse impacts to vegetation include limited surface disturbance of native range for access roads and turbine installation.

1.10.3 Wildlife

Potential adverse impacts to birds and bats includes the displacement of local birds from construction and operation of the wind farm, and resident and migratory bird and bat deaths from collisions with wind turbines and associated facilities and bat deaths from barometric trauma. Some mortality of small mammals may occur from construction and operation due to excavation and vehicle collisions.

1.10.4 Visual Resources

Wind turbines and associated facilities change the visual character of the area.

1.10.5 Noise

Wind turbines create noise that may be audible to area residents from some locations.

1.10.6 Aviation

Wind turbines may pose a risk to aircraft.

1.10.7 Economic Benefits and Expected Revenues

Construction and operation of a wind farm will create employment and tax revenue.

1.10.8 Historical and Archeological Sites

Construction and operation of the wind farm may disturb historical or cultural resources.

1.11 Issues Eliminated from Further Study

1.11.1 Water Quantity, Quality and Distribution

The United States Army, Corp of Engineers has authority to regulate projects that place fill material into waters of the United States under Section 404 of the Clean Water Act. Waters of the United States include the area below the ordinary high water mark of stream channels and lakes or ponds connected to the tributary system, and wetlands adjacent to these waters.

An inventory of all water features in the proposed project area has been completed. The project area contains one fish bearing stream and no lakes. The water features in the project area are stock water ponds, ephemeral streams, and Daisy Dean Creek. Because the gravelly nature of the soil is not conducive to water retention, there are few small wetland areas.

Under the Clean Water Act, The Montana Department of Environmental Quality (DEQ) administers the National Pollutant Discharge Elimination Program through the Montana Pollutant Discharge Elimination System program (MPDES). The MPDES storm water program regulates water discharge associated with construction projects. Construction projects that disturb one acre or more of earth are required to obtain

authorization under the General Permit for Storm Water Discharges Associated with Construction Activity.

Rationale for Elimination of Water Quantity, Quality, and Distribution from Further Analysis

Only one perennial stream, Daisy Dean Creek, is in the project area. It is anticipated that an individual permit under Section 404 of the Clean Water Act is not required.

The DEQ will require a General Storm Water Discharge permit that includes preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is typically completed shortly before project construction after completion of the final engineering design of the wind farm. It will contain an analysis of the characteristics of the site such as nearby surface water, topography, and storm water runoff patterns; identification of potential pollutants such as sediment from disturbed areas, and stored wastes or fuels; and identify Best Management Practices (BMPs) that will be used to minimize or eliminate the potential for these pollutants to reach surface waters through storm water runoff.

Martinsdale Wind Farm LLC has developed BMPs for wind farm construction that establish erosion and sediment control measures that mitigate potential effects to water quality, quantity, and distribution.

Because of the absence of valuable surface water features, the requirements of the DEQ storm water permitting process, and compliance with BMPs, project construction or operation is unlikely to have a negative effect on water quantity, quality, or distribution. Therefore, no direct, indirect, or cumulative effects are likely from the selection of any alternative and this resource has been eliminated from further analysis.

1.11.2 Air Quality

A planning and management process, "Prevention of Significant Deterioration" (PSD), was introduced as part of 1977 Amendments to The Clean Air Act. These PSD requirements set limits for increases in ambient pollution levels and establishes a system for preconstruction review of major projects. Three PSD classes have been established. Class I allows very small increases in pollution; Class II allows somewhat larger increases; and Class III allows air quality to deteriorate considerably more. The project area is located within a Class II airshed. A Class II airshed allows for moderate, well controlled growth in air pollution. However, the proposed wind turbines produce no air pollution emissions of any kind. A minor amount of fugitive dust generation is expected during construction but will be mitigated to levels below federal or state standards by implementation of best management practices.

Rationale for Elimination of Air Quality from Further Analysis

Wind turbines do not produce polluting emissions. BMPs will mitigate any expected effect from fugitive dust to below federal or state standards. Therefore, no direct, indirect, or cumulative effects are likely from the selection of any alternative and this resource has been eliminated from further analysis.

1.11.3 Recreational Use

The state land within the project area is not legally accessible to the public for recreational use. The Martinsdale Colony has allowed controlled access to private and state land for limited recreational use, mostly big game and upland bird hunting. Both the Martinsdale Colony and Martinsdale Wind Farm LLC would like to continue to allow permissive recreational access to state land within the project area.

State land subject to a commercial lease such as a wind farm are closed to recreational use as part of a group of categorical closures established in ARM 36.25.150. However this administrative rule allows Martindale Colony and Martinsdale Wind Farm LLC to petition the DNRC to lift the recreational use closure. Both parties have submitted the required written request to lift the recreational use closure and DNRC's intention is to grant that request.

Rationale for Elimination of Recreational Use from Further Analysis

Since recreational use would not change after construction of the wind farm, no direct, indirect, or cumulative effects are likely from the selection of any alternative and this resource has been eliminated from further analysis.

1.11.4 Public Safety

Public safety during the project construction phase is an issue associated with the movement of construction equipment along and onto Highway 12. No new approaches to Highway 12 are anticipated. Contractors will follow BMPs for wind farm construction regarding the movement of construction vehicles along the highway.

Rationale for Elimination of Public Safety from Further Study

The Montana Department of Transportation highway approach permitting process and BMPs for wind farm construction mitigate any potential danger to public safety. Therefore, no direct, indirect, or cumulative effects are likely from selection of any alternative and this resource has been eliminated from further analysis.

1.11.5 Noxious weeds

The project area is relatively free of noxious weeds. The Montana County Noxious Weed Management Act requires the submission of a weed control plan to the county weed board specifying weed control mitigation measures and revegetation plans prior to ground disturbing activities. The plan must describe the time and method of seeding, fertilization, recommended plant species, use of weed-free seed, and the weed management procedures to be used. This plan is subject to approval by the local weed board. Prior to entry of construction equipment on state land all construction equipment will be power washed to avoid transporting noxious weed seed onto state land. According to Martinsdale Wind Farm LLC's BMPs, areas disturbed during construction would be monitored for infestation by noxious weeds at regular intervals coinciding with routine wind farm maintenance and monitoring activities.

Rationale for Elimination of Noxious Weeds from Further Study

Compliance with the Montana County Noxious Weed Management Act through submission of a weed control plan to the Wheatland and Meagher County Weed Boards and adherence to BMPs mitigate potential for the introduction or spread of noxious weeds to the project area. Therefore no direct, indirect, or cumulative effects are likely from selection of any alternative and this resource has been eliminated from further analysis.

2.0 Alternatives Including the Proposed Action

2.1 Introduction

The purpose of Chapter 2 is to describe the alternatives and compare the alternatives by summarizing the environmental consequences. Alternatives were planned and shaped through scoping, development of issues, input from resource specialists, and compliance with state school trust mandates. This chapter describes the activities of the No Action alternative and the two action alternatives.

In most EISs, the No Action alternative means the project would not be built. In this EIS, the No Action alternative means the state does not have to take any action or make any decisions. If the No Action alternative were selected by the DNRC the project would still be built; but not on state land. Under the No Action alternative, the project could be built entirely on private land.

Two action alternatives are analyzed in this EIS. Under Alternative A, the state would lease state land for the construction of wind turbines, associated power lines and access roads. Under Alternative B, the DNRC would not allow construction of wind turbines on state land but would grant easements for power lines and roads to be built on state land. Alternative B would enable the construction of 20 additional turbines on private land. If the state does not lease the state parcels for wind energy development or issue easements, Martinsdale Wind Farm LLC intends to build the wind farm entirely on private land with no use of state land (No Action alternative). Under Alternative A, DNRC could require as lease agreement contractual stipulations the mitigation and monitoring measures listed in **Appendix C and D** for facilities located on state land. Under the No Action alternative and Alternative B, the DNRC has no authority to mandate mitigation and monitoring measures on private land. Martinsdale Windfarm LLC has indicated that it is their intention to implement these measures on a voluntary basis.

Based on the descriptions of the relevant resources in Chapter 3, *Affected Environment*, and the predicted effects of all alternatives in Chapter 4, *Environmental Consequences*, Chapter 2 summarizes the predicted effects of all alternatives on the quality of the human environment in comparative form, providing a clear basis for choice between the options for the decision maker and the public.

2.1.1 Process Used to Develop the Alternatives

The major environmental issues were identified during the scoping process and were defined and summarized in Chapter 1. In order to understand how the proposed construction alternatives would affect the environment, their effects are contrasted to

those of the No Action alternative. An important element to remember when making the contrast between the No Action and construction alternatives is that the No Action alternative contains the expected effects of the construction and operation of a wind farm on private land with no use of state land. The analysis of the construction alternatives discloses the additional impacts that are expected through the use of state land in the project area.

2.1.2 Alternatives Eliminated From Detailed Study

No other alternatives were developed. The subject state land was opened to a lease for wind energy development through the issuance of a Request for Proposals. Horizon was the successful bidder in this process and has exclusive rights for wind energy development on the state land and has entered into exclusive contractual arrangements with the private property owners in the project area. The Horizon project proposal met all project objectives and is the only action alternative proposed for state land.

Alternatives that included the installation of fewer wind turbines were considered but not selected for further analysis, because an analysis of the larger number of turbines would identify the "worst case" impacts.

2.1.3 The Agency Preferred Alternative

The DNRC has chosen Alternative A as the preferred alternative because Alternative A represents the best balance between avoidance of impacts and fulfillment of the DNRC's constitutionally and statutorily mandated objectives.

2.2 Description of Alternatives

There are three alternative analyzed for this project: the No Action alternative under which there would be no wind turbines, new roads, or power lines on state land and no additional decisions by DNRC; Alternative A, the Proposed Action, under which there would be 7 to 15 wind turbines, new roads, and power lines on state land; and Alternative B under which there would be no wind turbines on state land, however, there would be easements for underground power lines and new roads on state land.

If Alternative A were chosen as the preferred alternative, DNRC would reclassify the state land in the project area from its primary purpose of livestock grazing to the land classification "other" that allows for a primary purpose of wind farm development. DNRC would withdraw the subject land from the existing grazing leases and issue the existing grazing lessee a grazing license that would allow existing grazing practices to continue subordinate to the dominate interest of the wind farm. DNRC would then enter into a lease agreement with Martinsdale Wind Farm LLC that would allow the

construction and operation of wind turbines and associated facilities on state school trust land.

If Alternative B were chosen as the preferred alternative, DNRC would grant easements to Martinsdale Wind Farm LLC for underground power lines and access roads to cross state land.

2.2.1 No Action Alternative

The DNRC would not issue a lease for the development of wind energy production. No wind turbines or associated facilities would be placed on state land, no new roads would be constructed on state land, no underground electrical collection lines would be constructed on state land, and there would be no additional revenue from wind farm development. If this alternative were chosen, DNRC would have no additional decisions to make. Existing uses of state land would continue; however, wind farm development could continue on adjacent private land (**Figure 2.2-1**).

Project Description

Martinsdale Wind Farm LLC, a subsidiary of Horizon, has proposed a wind energy facility with an installed capacity up to 300 MW known as the Martinsdale Wind Power Project in central Montana approximately 20 miles west of Harlowton, Montana. The Montana DNRC conducted a competitive bid process to award a lease for wind development rights for the state's land on the project site. Horizon was awarded the lease.

The project is planned for two phases. Phase I would consist of approximately 27 wind turbine generators. Phase II would add approximately 58 to 115 wind turbine generators (depending on the size and type of generators selected) for a total of 85 to 142 generating units. Under the No Action alternative, the entire project would be constructed on the 15,557 acres of private land already under Martinsdale Wind Farm LLC's control and would not require a permit from DNRC.

Phase I would have a capacity of approximately 58 MW. The project's major components would include an underground electrical collection system, a project step-up and interconnect substation, a SCADA communication system, hub height free-standing meteorological towers, access roads, turbines, foundations, grid interconnection facilities, an O&M center, and associated supporting infrastructure and facilities.

Figure 2.2-1 No Action Alternative

The preliminary project layout situates wind turbine generators, spaced to maximize energy capture, on well exposed terrain (**Figure 1.1-1**). The layout would be revised following a complete survey of the area and turbine selection.

Martinsdale Wind Farm LLC has not yet selected specific wind turbine generators for full build out and is considering a range of viable options to determine the best technology and manufacturer combination for the project. For this reason, the permit application allows for flexibility in the number and size of generators to be installed.

Phase II would expand the project to an estimated total capacity of about 300 MW. The building of Phase II is dependent on the availability of additional transmission capacity.

Phase I of this project would connect directly to NorthWestern Energy's 100-kV Two Dot to Great Falls transmission line that crosses the project site. The transmission line that would be used for Phase II is unknown at this time. **Figure 1.1-1** shows the general location of the proposed project.

Site Location

The project under the No Action alternative would be located entirely on about 15,557 acres of private land approximately 20 miles west of Harlowton, Montana. This is one of the windiest areas of central Montana north of the Crazy Mountains. The general area is characterized by rolling hills in a rural landscape of dry, rocky grasslands, areas of irrigated and dry land farming, grazing land and areas covered with a mixture of sagebrush, bitterbrush, and bunch grasses. Turbines would be placed on open ridge tops in the rolling hills above the Musselshell River, where strong northwest winds accelerate as they pass through the valley over the rolling hills. The overall population density in the area is very low with few dwellings in the vicinity of the project site other than the Colony complex. Land use in the area consists of ranching and farming on privately-owned land held by large landowners and state-owned property managed by DNRC.

Description of the Wind Farm Including Possible Phasing of Construction, and Location of Ancillary Facilities (Substation, etc.)

Phase I
Under the No Action alternative, the project will have an installed capacity of approximately 58 MW. The project's major components include roads, foundations, underground grid interconnection facilities, a substation, an O&M center, and associated supporting infrastructure and facilities. A general site layout illustrating these elements is contained in **Figure 2.2-1**.

The private property for the proposed wind farm is all or part of the legal descriptions listed in **Table 2.2-1**.

Turbines will be located on well exposed features, spaced to maximize energy capture through careful siting and to minimize wake and array losses. This layout would likely be revised following a complete survey of the area, and turbine selection.

Although other generator options will be evaluated to determine the best technology and manufacturer combination for the site, Suzlon 588/2100 (2.1 MW) generators are the current choice. With the Suzlon generator the turbine hub would be about 262 feet above ground. Each turbine would have three 141-foot rotor blades for a maximum height of about 406 feet. The rotors would turn between 15 and 18 revolutions per minute with a tip speed of about 161 miles per hour.

TABLE 2.2-1
PRIVATE PROPERTY FOR MARTINSDALE WIND FARM

County	Township	Range	Section	Subsection
Meagher	9 North	11 East	13	S½
			23:	All
			24:	W½ and the W½E½
			25:	All
Wheatland	8 North	12 East	1	All
			2	All
			3	All
			4	All (less r-o-w)
			5	NE¼ , N½ ,SE¼ (less R-O-W)
			11	All (less R-O-W)
			12	All
			13	All (less R-O-W and portion S of Hwy 12)
Wheatland	8 North	13 East	7	All
			17	All (less 0.38 acres, NSWC Building)
			18	All (less R-O-W and portion S of Hwy 12)

TABLE 2.2-1
PRIVATE PROPERTY FOR MARTINSDALE WIND FARM

County	Township	Range	Section	Subsection
Wheatland	9 North	12 East	15	S½
			17	All
			19	All
			20	S½NE¼ , NE¼SE¼
			21	All
			22	All
			27	All
			28	N½N½, S½NE¼, N½SE¼
			29	All
			31	N½ , N½ S½ (less tract in NW¼ NW¼ described in Certificate of Survey No. 96188 filed 3-7-1995, records of Wheatland County, MT)
			33	All
			34	All
			35	All

Phase II
Upon availability of additional transmission capacity, the project would be expanded to have an estimated total capacity of 300 MW.

	Capacity (MW)	Permitting Agency	Commercial Online Date
Phase I	58	State – Building permit	12/2010
Phase II	227.5	State – Building permit	12/2013

The project components for Phase II would be the same as listed under Phase I. The following sections describe these project components.

Collector Line and Substation Construction

The collection and transmission system would collect generated energy and transmit it to a new substation near NorthWestern Energy's 100-kV transmission line. The location of the project substation relative to the other project components is shown on **Figure 2.2-1.**

Collection and Transmission System
Electrical power generated by the wind turbines would be transformed and collected through a network of underground electrical cables that terminate at the project substation.

Power from the wind turbines will be generated at 575 to 690 Volts (V), depending on the type of wind turbine used. Power from the turbines would be fed through a breaker panel at the turbine base inside the tower and would be interconnected to a pad-mounted or nacelle-encased step-up transformer at the tower base that steps the voltage up to 34.5 kV. The transformers would be networked on the high side to underground cables that connect all of the turbines together electrically. The underground cables will be installed in trenches that run beside the project's roadways as shown in **Figure 2.3-1**. Depending on geotechnical analysis at the site, native material or a clean fill material such as sand or fine gravel would be used to cover the cable before the native soil and rock would be backfilled over the top and reseeded.

The underground collection cables would feed to larger feeder lines that run to the main substation. At the substation, the electrical power from the entire wind farm is stepped up to transmission level at 100 kV and delivered to the point of interconnection. In locations where two or more sets of underground lines converge, underground vaults and/or pad mounted switch panels would be used to tie the lines together into one or more sets of larger feeder conductors.

Supervisory Control and Data Acquisition (SCADA) System
Each turbine would be connected to a central SCADA System through a network of underground fiber optic cable. The SCADA system allows for remote control monitoring of individual turbines and the wind plant as a whole from both the central host computer and from a remote computer. In the event of faults, the SCADA system can also send signals to a fax, pager, or cell phone to alert operations staff.

The SCADA system delivers real-time power output from the project which can be accessed by power scheduling and system controls personnel to support real-time and hour-ahead power schedule schemes.

Interconnection Facilities and Substation
The main functions of the substation and interconnection facilities would be to provide fault protection and to step up the voltage from the collection lines (at 34.5 kV) to the transmission level (100 kV) required to interconnect to the utility grid. The basic elements of the substation and interconnection facilities would be a control house, a bank of main transformers, outdoor breakers, relaying equipment, high voltage bus work, steel support structures, and overhead lightning suppression conductors. All of these main elements would be installed on concrete foundations that are designed for the soil conditions at the substation site. The substation and interconnection facilities

would be at the site of the present substation and will consist of a graveled footprint area of approximately two to four acres, a chain link perimeter fence, and an outdoor lighting system.

Final adjustment to the substation and interconnect would generally be made during design review with the interconnecting utility and their system protection engineers to accommodate for grid conditions at the time of construction.

Wind Farm

Turbine Foundations

During the detailed engineering design phase of the project, and prior to construction, a formal geotechnical investigation would be performed to analyze soil conditions, and test for voids and homogeneous ground conditions. Depending on the results of the geotechnical investigation, either spread footing type foundation or a vertical mono-pier foundation would be used. The foundation design would be tailored to suit the soil and subsurface conditions at the various turbine sites. The foundation design will be certified by an experienced and qualified, state-registered structural engineer.

Operation and Maintenance (O&M) Facility

An O&M facility would be located on approximately 6 acres in an old gravel pit adjacent to Highway 12 near the southeastern corner of the project boundary. The O&M facility would include a main building with offices, spare parts storage, restrooms, a shop area, outdoor parking facilities, a turn around area for larger vehicles, outdoor lighting, and a gated access with partial or full perimeter fencing.

Construction of the wind turbines is relatively quick in comparison to other types of power plants. Martinsdale Wind Farm LLC expects to bring the proposed project on-line in a matter of months after the EIS process is completed and construction is authorized. Although construction impacts will be temporary and short-lived, heavy equipment, including bulldozers, graders, trenching machines, concrete trucks, flatbed trucks, and large cranes, would be required. Wind farm construction typically occurs in the following sequence:

- *Civil Construction* – Civil Construction is usually performed about three to six weeks before any other phase of construction begins. It entails surveying, cleaning, grubbing, grading, excavation, and foundation construction. This civil work is also performed for support facilities such as laydown area (approximately 10 acres); portable ready mix facilities, if applicable; construction office, and employee parking areas (approximately 2-3 acres).

- *Delivery and Access* – Major wind turbine components including rotor assemblies, towers, power cables, and transformers would be delivered to the site by flatbed, semi-tractor trailers. An area approximately 4.5 acres, would be temporarily disturbed alongside the turbine sites for rotor assembly, installation, underground electrical, road, and access way construction. Turbines would be accessed by graveled roads branching from existing roads on private land (**Figure 2.3-1**). New site roads would be designed to carry heavy equipment and would be used throughout the life of the project for access to and from the wind turbines, substations, and meteorological monitoring towers. The road design has been prepared to minimize the overall disturbance footprint and avoid erosion risks. Wherever practical, existing roads have been used to minimize new ground disturbance. The roads would have a 22-foot wide compacted graveled surface in most areas and a 34-foot-wide surface in other areas to support large cranes used to erect the wind turbine generators. In areas of steeper grades, a cut and fill design will be implemented to keep grades below 15% to help prevent potential erosion issues.

- *Electrical* – Electrical work would include the underground collection system that would interconnect into NorthWestern's transmission system via the underground medium voltage (34.5 kV) collection lines and substation previously discussed. This phase typically starts three to four weeks after the civil construction phase.

- *Structural* – Structural work would entail wind turbine and tower assembly, and erection onto turbine foundations. This phase would also include installation of all mechanical and electrical systems associated with the turbines. Typically, this phase would occur six to eight weeks following the beginning of civil construction.

- *Testing* – This phase would start well into the proposed project, usually three to six months after the start of construction, and would typically last two to three months. This phase would include all the testing required to make the wind farm commercially operational. This incremental process would include energizing the interconnect substation, and bringing each turbine on line until the commercial operation date is declared.

- *Weed Control* – Martinsdale Wind Farm LLC would make reasonable and conscientious efforts to control the introduction and suppression of all weeds its operations introduce, or are likely to have introduced. Noxious weeds will be controlled using appropriate mechanical, biological and chemical treatments that meet the requirements of Montana and Federal laws and a weed control plan developed among the landowners, County weed control officials and Martinsdale Wind Farm LLC.

- *Rock Crushing and Aggregate* – The private landowner currently holds permits for two gravel pits. It is anticipated that some of the aggregate necessary for the project would be produced from the existing permitted sites. If needed, aggregate would be purchased locally from licensed gravel mines. The necessary permits would be obtained if blasting or other such activities are required.

- *Water Supply* – The private landowner will provide the water necessary for the construction operations. Martinsdale Wind Farm LLC has agreed to obtain water from a secondary approved source if the volume needed exceeds water availability from the landowner and/or negatively impacts their on-going farming and ranching operations.

- *Restoration and Final Project Completion* – This final activity in wind farm construction would entail restoration and clean-up of all project disturbances, erecting necessary signs and gates and identifying permanent operations and maintenance facilities.

Under the No Action alternative there would be a temporary disturbance of 496.53 acres of private land for buried power lines and construction of 99 turbines, and 185.91 acres of permanently altered land for turbines and roads as shown in **Figure 2.2-1**.

2.2.2 Alternative A, Wind Turbines on State Land (Proposed Action)

This alternative would be much the same as the No Action alternative except that under Alternative A, 7 to 15 turbines would be placed on state land as shown in **Figure 2.2-2**. At about three acres per turbine, this would cause the temporary disturbance of 21 to 45 acres of state land and up to 591.62 acres of private land for buried power lines and construction of 126 turbines. There would be 13.51 to 22.46 acres of permanently altered state land for turbines and roads, and up to 214.43 acres on private land.

These turbines would produce approximately 2.1 MW of electricity per turbine. The common school trust would receive a one-time installation payment of $1,500 per installed megawatt ($22,050 assuming the construction of seven 2.1 megawatt turbines), a land use license of $1.50 per acre during construction ($4,620 for 3,080 acres), and an estimated minimum annual payment of $36,750, based on 3% of the annual revenue per turbine, with a minimum $2,500 per MW for each turbine.

The legal description of the state parcels proposed for use by Martinsdale Wind Farm LLC are in **Table 2.2-2**.

TABLE 2.2-2
STATE PROPERTY FOR MARTINSDALE WIND FARM

County	Township	Range	Section	Subsection
Meagher	9 North	11 East	24	E½ NE¼ and E½ SE¼
Meagher	9 North	12 East	16	All
			18	SW¼
			20	NW¼, SW¼, N½ NE¼, NW¼ SE¼, S ½ SE¼
			28	S ½ NW¼, SW¼, S½ SE¼
			30	All
			32	All

Figure 2.2-2 Alternative A

2.2.3 Alternative B, Easements on State Land

This alternative would be much the same as the No Action alternative except that the DNRC would issue easements for roads and buried power lines across state parcels as shown in **Figure 2.2-3**. This would cause the temporary disturbance of 3.03 acres for power lines and roads on state land and 591.62 acres for power lines and construction of 119 turbines on private land. There would be 10.01 acres of permanently altered land for roads on state land and 214.43 acres for roads and turbines on private land.

2.3 Environmental Protection Measures, Applicable to All Alternatives

Several documents would provide environmental protection guidance for project construction contractors. These documents include Martinsdale Wind Farm LLC's general bidding instructions, and BMPs. Summaries and/or applicable parts of each of these guidelines follow.

General Bidding Instructions

Environmental protection requirements would be included in Martinsdale Wind Farm LLC's instructions to prospective contractors bidding on construction of the proposed wind farm. Several noteworthy requirements identify the contractor as responsible for the following:

- *Solid and Sanitary Waste Disposal* -- Contractor shall pick up solid wastes and place in containers that are regularly emptied, dispose of garbage in approved containers that are regularly emptied, and prevent contamination of the proposed project site and other areas when handling and disposing of wastes. Upon completion of the work, Contractor shall leave the work areas clean, and control and dispose of wastes.

- *Petroleum Products* -- Contractor shall conduct fueling and lubrication of equipment and motor vehicles in a manner to protect against spills and evaporation, and shall dispose of unused lubricants and oils.

- *Dust* -- Contractor shall implement dust control at all times in accordance with applicable local and state requirements. Contractor shall keep dust down at all times during construction. Air blowing would be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Contractor shall not permit the shaking of bags of cement, concrete mortar, or plaster.

Figure 2.2-3 Alternative B

- *Temporary Construction* – Contractor shall remove temporary construction facilities (erected by and within Contractor's scope), including access road-entrance-way build ups, access road corner widening, crane pads, work areas, structures, foundations of temporary structures, and stockpiles of excess or waste materials.
- *Protection of Roads* -- Contractor shall plan and practice measures to minimize the impact to the existing landowner, township, county, and state roads. Measures shall include demanding low speed limits for heavy vehicles and equipment traveling on the roads.

Martinsdale Wind Farm LLC Best Management Practices During Wind Farm Construction

Martinsdale Wind Farm LLC has developed BMPs for wind farm projects. These include:

- *Disturbance Minimization* – The proposed wind farm project will be constructed to fit the existing terrain, thereby minimizing land-disturbing cut and fill activities, minimizing disturbance to existing drainages, and reducing soil erosion potential.
- *Sediment Control* -- Potential sediment movement to nearby drainages and wetlands resulting from construction disturbance will be controlled by installing silt fencing on the downhill side of access roads along low areas, and installing gravel entrances at public roads prior to grading activities to prevent vehicle tracking.
- *Fueling and Equipment Maintenance* -- Construction equipment will be fueled and maintained at an equipment maintenance staging area that will be designed to contain spills. Accidental spills will be cleaned up immediately following state regulations.
- *Reclamation/Revegetation* – Areas disturbed during construction will be graded to blend with the natural terrain, scarified, and seeded with species at landowner request or with regionally native species.
- *Inspection/Maintenance* -- Silt fencing will be inspected within 24 hours of each rain event of 1/2 inch or greater, maintained by removing sediment after a 50 percent loss of capacity, and replaced as necessary.

Martinsdale Wind Farm LLC Best Management Practices During Wind Farm Operation

Martinsdale Wind Farm would continue to follow BMPs during operation of the proposed wind farm. These specifically include:

- *Access Road Maintenance* – Permanent access road gravel surfaces within the proposed wind farm would be maintained to ensure positive drainage and minimize sediment runoff.

- *Noxious Weed Control* – Areas disturbed during construction would be monitored for infestation by noxious weeds at regular intervals coinciding with routine wind farm maintenance and monitoring activities.

- *Revegetation Monitoring* - Reseeding efforts using native grass seed mixes on areas disturbed during construction that are not being used for crop production would be monitored for success annually (in the spring) for two years following construction. If revegetation efforts are not or only partially successful, appropriate reseeding measures would be taken.

Future Studies

Martinsdale Wind Farm LLC will fund an operational monitoring program to directly estimate the impacts of the wind farm on birds and bats. The operational monitoring plan for the project will consist of the following components:

- Fatality monitoring, for a minimum of two years within the Phase I project area and a minimum of one year on the Phase II site (March 15 – November 15th), using standardized carcass searches and carcass removal and searcher efficiency trials; and a protocol for handling and reporting of fatalities and injured wildlife for the life of the project;

- Surveying, for a minimum of two nesting periods post-construction, for golden eagle and ferruginous hawk nests within 2 miles of the Phase I and II wind turbines on lands Martinsdale Wind Farm, LLC can legally access;

- Using a Technical Advisory Committee of the various stakeholders to review methodologies and results and make recommendations regarding the need to modify existing methods and the desirability of additional monitoring beyond the effort described in this plan.

Rationale for Not Conducting Displacement Studies of Grassland Birds

There are currently no plans for studies of the breeding grassland bird displacement. Several studies in the western U.S. have estimated displacement effects for several of the most common species expected on this site. The grassland resident species most common on the site (horned lark) has been shown not to be displaced by wind turbines (Erickson et al. 2004, D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication with Wallace Erickson). Horned larks appeared least impacted, likely because this species prefers areas of bare ground such as those created by turbine pads and access roads (Beason 1995).

A long-term grassland bird displacement study at a wind energy facility in South Dakota found that chestnut-collared longspur (*Calcarius ornatus*) and western meadowlarks did not appear to avoid turbines, whereas grasshopper sparrows

(*Ammodramus savannarum*) appeared to avoid turbines out to a distance of 656 ft (200 m; D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication with Wallace Erickson). McCown's longspur, a species potentially similar in behavior to the chestnut-collared longspur and western meadowlark's are also two of the more common grassland songbird species expected at the project site.

Based on these studies, it doesn't appear that much additional information would be gained from these studies. In addition, the Phase I site is relatively small, so a study on Phase I in grassland habitat will likely not have enough statistical power and sample size necessary to determine the level of displacement. It may be possible to implement a displacement study for the Phase II site, if it is determined by the DNRC to be warranted at that time. One factor in making that decision would be the availability of additional studies of displacement of breeding grassland songbirds residing at the Martinsdale project. If it is determined that such a study is warranted for Phase II, it is imperative that at least one year of pre-construction data is collected using methods identified in the Judith Gap monitoring plan or those used by Erickson et al. (2004) and D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication be employed

2.4 Summary Comparison of Activities, the Predicted Achievement of the Project Objectives, and the Predicted Environmental Effects of All Alternatives

2.4.1 Summary Comparison of Project Activities

Table 2.4-1 provides a comparison of on-the-ground activities that would occur if Alternative A, B, or the No Action alternative were implemented. The permanently altered and temporarily disturbed acres are shown for state and private land for each alternative. For Alternative A there is a comparison between 7 turbines on state land and 15 turbines on state land.

Table 2.4-2 provides a comparison of state land objectives for No Action, Alternative A, and Alternative B. **Table 2.4-3** provides a comparison of predicted environmental effects for each of the three alternatives.

TABLE 2.4-1
SUMMARY COMPARISON OF PROJECT ACTIVITIES

COMPONENT TYPE	COMPONENT DESCRIPTION	EIS ALTERNATIVE							
		NO ACTION		ALTERNATIVE A				ALTERNATIVE B	
				7 Turbines on State Land		15 Turbines on State Land			
		Units	Acres	Units	Acres	Units	Acres	Units	Acres
TURBINES									
Turbines on State Land	Number of turbines	0		7		15		0	
	Temporary Disturbance - (4.5 acres/turbine)				31.5		67.5		
	Permanent Disturbance - (0.5 acres/turbine)				3.5		7.5		
Turbines on Private Land	Number of turbines	99		119		111		119	
	Temporary Disturbance - (4.5 acres/turbine)		445.5		535.5		499.5		535.5
	Permanent Disturbance - (0.5 acres/turbine)		49.5		59.5		55.5		59.5
Total Turbines	Number of turbines	99		126		126		119	
	Temporary Disturbance - (4.5 acres/turbine)		445.5		567		567		535.5
	Permanent Disturbance - (0.5 acres/turbine)		49.5		63		63		59.5
ROADS									
Roads on State Land	34-feet-wide Roads (miles / acres)	0	0	1.2	4.95	2.4	9.89	1.2	4.95
	22-feet-wide Roads (miles / acres)	0	0	1.9	5.07	1.9	5.07	1.9	5.07
	Total State Roads (miles / acres)	0	0	3.1	10.01	4.3	14.96	3.1	10.01
Roads on Private Land	34-feet-wide Roads (miles / acres)	18.8	77.48	22	90.67	20.8	85.72	22.0	90.67
	22-feet-wide Roads (miles / acres)	22.1	58.93	24.1	64.27	24.1	64.27	24.1	64.27
	Total Private Roads (miles / acres)	40.9	136.41	46.1	154.93	44.9	149.99	46.1	154.93

TABLE 2.4-1
SUMMARY COMPARISON OF PROJECT ACTIVITIES

COMPONENT TYPE	COMPONENT DESCRIPTION	EIS ALTERNATIVE							
		NO ACTION		ALTERNATIVE A				ALTERNATIVE B	
				7 Turbines on State Land		15 Turbines on State Land			
		Units	Acres	Units	Acres	Units	Acres	Units	Acres
Total Roads	34-feet-wide Roads (miles / acres)	18.8	77.48	23.2	95.61	23.2	95.61	23.2	95.61
	22-feet-wide Roads (miles / acres)	22.1	58.93	26.0	69.33	26	69.34	26.0	69.33
	Total Roads (miles / acres)	40.9	136.41	49.2	164.95	49.2	164.95	49.2	164.95
UNDERGROUND TRANSMISSION LINES									
Underground Lines on State Land	10-feet-wide Disturbance (miles / acres)	0	0	2.5	3.03	5.36	6.50	2.5	3.03
	20-feet-wide Disturbance (miles / acres)	0	0	0	0	0	0	0	0
	Total State Land Lines (miles / acres)	0	0	2.5	3.03	5.36	6.50	2.5	3.03
Underground Lines on Private Land	10-feet-wide Disturbance (miles / acres)	24.1	29.21	28.3	34.30	22.94	27.81	28.3	34.30
	20-feet-wide Disturbance (miles / acres)	9.0	21.82	9.0	21.82	9.0	21.82	9.0	21.82
	Total Private Lines (miles / acres)	33.1	51.03	37.3	56.12	31.94	49.62	37.3	56.12
Total Underground Lines	10-feet-wide Disturbance (miles / acres)	24.1	29.21	30.8	37.33	28.3	34.30	30.8	37.33
	20-feet-wide Disturbance (miles / acres)	9.0	21.82	9.0	21.82	9.0	21.82	9.0	21.82
	Total Underground Lines (miles / acres)	33.1	51.03	42.3	62.18	42.66	62.62	42.3	62.18

TABLE 2.4-1
SUMMARY COMPARISON OF PROJECT ACTIVITIES

COMPONENT TYPE	COMPONENT DESCRIPTION	EIS ALTERNATIVE							
		NO ACTION		ALTERNATIVE A				ALTERNATIVE B	
				7 Turbines on State Land		15 Turbines on State Land			
		Units	Acres	Units	Acres	Units	Acres	Units	Acres
TOTAL DISTURBANCE									
Temporarily Disturbed Acres (Turbine Laydown & Underground Lines)	State Land (Acres)		0		34.53		74		3.03
	Private Land (Acres)		496.53		591.62		549.12		591.62
	Total Land (Acres)		496.53		626.15		623.12		594.65
Permanantly Disturbed Acres (Turbine Base & Roads)	State Land (Acres)		0		13.51		22.46		10.01
	Private Land (Acres)		185.91		214.43		205.49		214.43
	Total Land (Acres)		185.91		227.95		227.95		224.45

TABLE 2.4-2
SUMMARY COMPARISON OF PREDICTED ACHIEVEMENT OF PROJECT OBJECTIVES

	Indicators	No Action	Alt A	Alt B
Objective 1: Lease the right to use state land for the production of wind energy and generate the maximum legitimate monetary return to the common school trust.	Annual income to the common school trust	No income from wind energy. Continued annual income of approximately $5,961 from grazing ($6.94/AUM) and $11,205 from agricultural use ($15/acre).	Assuming ½ the turbines would be on grazing land and ½ on agricultural land – income of approximately $5,923 from grazing and $10,875 from agricultural use. The lease of state land for wind energy will produce the greater of: $2,500 minimum per megawatt generated on state land or 3% of the gross revenue generated by wind turbines (Years 1-10). School trust revenue is projected to be between $36,750 and $42,913 annually for seven turbines. The exact revenue is not known at this time. Completion of a power purchase agreement will determine the exact number of turbines that will be constructed on state land and the market price per megawatt.	Additional income from easements on 13.04 acres of state land for roads and power lines of approximately $5,216.

TABLE 2.4-2
SUMMARY COMPARISON OF PREDICTED ACHIEVEMENT OF PROJECT OBJECTIVES

	Indicators	No Action	Alt A	Alt B
Objective 2: Manage the state rangeland for the desired future condition characterized by a healthy native plant and animal community	Plant species composition and vigor	Plant species composition would be unchanged.	13.01 to 22.46 acres of grazing land would be permanently disturbed. Plant species and vigor on over 99% of the state land would remain unchanged.	10.01 acres of grazing land would be permanently disturbed. Plant species and vigor on over 99% of the state land would remain unchanged.
	Livestock carrying capacity	State Land Animal Unit Month (AUM) Carrying Capacity of approximately 858 would remain unchanged.	A reduction of approximately 3 to 6 AUM.	A reduction of approximately 2.5 AUM.
	Healthy wildlife populations	Wildlife includes pronghorn, mule deer, small mammals, grassland songbirds, raptors, such as red-tailed hawks, golden eagles and northern harriers.	A minor impact to mammal populations would occur during project construction. Some mortality of birds and bats is expected from the project and this would be monitored.	A minor impact to mammal populations would occur during project construction. Some mortality of birds and bats is expected from the project and this would be monitored.

TABLE 2.4-3
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Avian and bat mortality from collision with wind turbines and bat mortality from barometric trauma.	Approximately 4.62 or fewer bird and 13.4 or fewer bat deaths per turbine per year. With 99 turbines, up to 458 bird deaths and up to 1326 bat deaths could be expected per year. Most resident bird fatalities would be of common species such as horned lark and McCown's longspur with up to14 raptor deaths per year. Monitoring will be conducted to estimate actual levels.	Approximately 4.62 or fewer bird and 13.4 or fewer bat deaths per turbine per year. With 126 turbines up to 582 bird deaths and up to1689 bat deaths could be expected per year. Most resident bird fatalities would be of common species such as horned lark and McCown's longspur with up to18 raptor deaths per year. Monitoring will be conducted to estimate actual levels.	Approximately 4.62 or fewer bird and 13.4 or fewer bat deaths per turbine per year. With 119 turbines, up to 550 bird deaths and up to 1595 bat deaths could be expected per year. Most resident bird fatalities would be of common species such as horned lark and McCown's longspur with up to17 raptor deaths per year. Monitoring will be conducted to estimate actual levels.
Avian displacement due to turbine proximity	Some small scale displacement of breeding songbirds is expected from project facilities.	Same as the No Action alternative.	Same as the No Action alternative.
Soil Resources	A minor amount of soil compaction and erosion will occur.	Same as the No Action alternative with slightly more area effected.	Same as the No Action alternative with slightly more area affected.
Vegetation and Land Use	Construction of the wind farm on private land would permanently alter 186 acres of grazing, agricultural and forest land. Temporary disturbances totaling 299 acres would be revegetated. Within the 19,341acre wind farm area over 98% of existing vegetative cover would remain undisturbed or be revegetated.	Construction of the wind farm on all ownerships would permanently alter 228 acres of grazing, agricultural and forest land. Temporary disturbances totaling 375 acres would be revegetated. Within the 19,341 acre wind farm area over 98% of existing vegetative cover would remain undisturbed or be revegetated.	Construction of the wind farm on all ownerships would permanently alter 225 acres of grazing, agricultural and forest land. Temporary disturbances totaling 357 acres will be revegetated. Within the 19,341 acre wind farm area over 98% of existing vegetative cover would remain undisturbed or be revegetated.

TABLE 2.4-3
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Vegetation and Land Use (Cont.)	Some displacement of grazing and cropping activities would occur during the construction phase of wind farm development. Post construction, grazing, cropping, and wind energy production are expected to co-exist without conflict.	Some displacement of grazing and cropping activities would occur during the construction phase of wind farm development. Post construction, grazing, cropping, and wind energy production are expected to co-exist without conflict. DNRC would cancel the existing grazing leases and issue an adjusted grazing license to the existing grazing lessee. The predominant classification of the land would be for wind energy production. A small reduction in AUMs is expected as a result of this reclassification.	Some displacement of grazing and cropping activities would occur during the construction phase of wind farm development. Post construction, grazing, cropping, and wind energy production are expected to co-exist without conflict. DNRC would issue easements for roads on 10.01 acres and adjust grazing leases accordingly. A small reduction in AUMs is expected as a result of this reclassification.
Visual Impacts	Construction of the wind farm will introduce prominent new features to the visual character of the area. Whether this is a beneficial or detrimental impact is up to the individual observer.	Somewhat more than the No Action alternative because of the 27 additional turbines.	Somewhat more than the No Action alternative because of the 20 additional turbines.

TABLE 2.4-3
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Noise	The proposed project is located in a rural agricultural area. It is predicted that the wind turbines will produce approximately 35 A-weighted decibels at 0.5 mile. The baseline noise level in the area is approximately 35 to 45 dBA (L_{dn}). It is expected that wind speeds will mask the noise generated by the wind turbines at distances greater than 1,000 feet. There are no non-Colony noise receptors closer than 1 mile to any proposed turbine.	Somewhat more than the No Action alternative because of the 27 additional turbines.	Somewhat more than the No Action alternative because of the 20 additional turbines.
Economic benefits and expected revenue. (State tax is based on estimated equipment capital costs.)	Estimated state taxes up to $7,986,528 annually for 99 turbines. Meagher County turbines would generate $62,832 and Wheatland County turbines would generate $722,568 in annual property taxes. Estimated construction employment of up to 287. Estimated permanent operation employment up to 18.	Estimated state taxes up to $10,164,672 annually for 126 turbines. Meagher County turbines would generate $107,100 and Wheatland County turbines would generate $1,082,900 in annual property taxes. Estimated construction employment up to 434. Estimated permanent operation employment up to 27.	Estimated state taxes up to $9,599,968 annually for 119 turbines. Meagher County turbines would generate $84,966 and Wheatland County turbines would generate $859,101 in annual property taxes. Estimated construction employment up to 334. Estimated permanent operation employment up to 21.

TABLE 2.4-3
SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL EFFECTS

Issue	No Action Alternative	Alternative A - Construction	Alternative B - Construction
Historical and archeological sites	There is no legal obligation to conduct historical or cultural resource inventories on private land. However, if any sites were discovered the State Historic Preservation Office would be notified and the site would be avoided, or properly documented.	A project-specific cultural resource inventory would be conducted on state land when proposed developments are finalized Much of the land has been previously disturbed through cultivation. If any historical or archeological sites are encountered below plow depth, construction would be halted until consultation with the State Historic Preservation Office is completed.	Same as the Alternative A and Alternative B.
Aviation	The wind farm will be located approximately 19 miles from the nearest airport at Harlowton and approximately 50 miles from the nearest commercial airport in Lewistown. It would not impact any airport operations. The Martinsdale area is within a defined aircraft flight path between Great Falls and Billings, but lighting on the turbines would mitigate any impacts to aviation.	Similar to the No Action alternative.	Similar to the No Action alternative.

2.5 Past, Present, and Reasonably Foreseeable

Past Relevant Actions, Applicable to all Alternatives

- Livestock grazing – The state land is currently leased for the grazing of livestock and that activity would continue.
- Fire suppression – Human and natural caused fires have been and would continue to be suppressed.
- Hunting and other recreational uses – limited deer, antelope, and upland bird hunting could continue with permission of the private landowner, under the regulation of the Montana Department of Fish, Wildlife and Parks (FWP).
- State Land Road Use – all existing roads would remain closed to public vehicle traffic. Roads remain open for emergency services, administrative use, and use by the lessee.

Present Relevant Actions Not Part of the Proposed Action, Applicable to all Alternatives

- Same as Past Relevant Actions.

Reasonably Foreseeable Relevant Actions Not Part of the Proposed Action, Applicable to all Alternatives

- Construction and operation of the project would continue on neighboring private land. The effects of construction on private land are disclosed under the No Action alternative.
- InvEnergy has announced that they wish to add 33 more turbines to the Judith Gap Wind Energy Center. However, they stated they will not add the turbines until they find a buyer for the electricity. At this point they have not announced a buyer or firm plans for expansion.
- The owners of the Colstrip to Townsend power line are currently conducting a feasibility study on upgrading their 500-kV line but have not announced firm plans to do so.
- Martinsdale Wind Farm, LLC, has leased additional land in the area and is negotiating leases for more land. Other area landowners may be negotiating with wind energy companies for wind farms but no plans have been announced.
- Between the proposed project site and Harlowton there are currently two small turbine strings with six and seven smaller generators. There are no known plans to expand these facilities.

3.0 Affected Environment

The affected environment descriptions provided in this chapter succinctly describe the relevant resources that would be affected by construction of the Martinsdale Wind Farm project. This chapter also describes relevant factors of the existing environment that may be impacted by past and ongoing activities within the analysis area that might affect the EIS resource areas, project implementation, and operation of the wind farm. In conjunction with the description of the No Action alternative in Chapter 2 and with the predicted effects of the action alternatives, the public can compare the effects of the alternatives.

3.1 Geology and Soil Resources

3.1.1 Analysis Methods and Analysis Area

Issues of concern associated with geologic resources are: the potential for seismic activity, mass movement, subsidence, and mineral resources. Issues associated with soil resources are soil stability, potential for erosion, compaction, salinity, construction requirements for roads and access, and revegetation.

The EIS analysis used GIS to display maps depicting the geologic and soil properties that could be affected by the proposed project or alternatives. Geologic information was collected from U.S. Geological Survey (USGS) topographic maps, USGS seismic risk data, geologic maps, and data primarily from the Montana Bureau of Mines and Geology (MBMG) and the USDA Soil Conservation Service (Veseth and Montagne 1980). Data for important soil properties, including soil type, soil depth, soil stability, potential for erosion, compaction, salinity, limitations for roads and access, and revegetation, were acquired from the NRCS database (NRCS 2006a), and aerial photo interpretation. Geologic and soil resources (slope stability and erosion potential) that could be affected differently by the location of the wind turbines and access roads were evaluated and compared for the three alternatives.

The analysis area for geologic and soil resources is the same as the project analysis area. The analysis area includes approximately 16,397 acres in Wheatland County and 2,240 acres in Meagher County. The analysis area is contiguous and includes both private- and state-owned land.

3.1.2 Affected Environment

Geology and soils in the analysis area are described below in terms of characteristics relevant to the issues of concern.

3.1.2.1 Geology

The main geologic bedrock units present in the analysis area are the moderately hard sandstones of the Eagle Sandstone and Telegraph Creek formations along with soft gray shales of the overlying Claggett Shale formation (USGS 2007). These bedrock formations occur primarily as ridges and pediment upland areas but are also exposed along Daisy Dean Creek. The valleys are primarily filled with soft tertiary valley-fill sediments along with areas of colluvium and more recent alluvial gravels. Areas of landslide deposits are mapped along the southern side of a pediment upland that traverses Sections 13 and 24 in Township 9N, Range 11E, in Meagher County and Section 19 in Township 9 N, Range 12 E in Wheatland County (USGS 2007). The Tertiary-aged sediments are poorly sorted and may contain a mixture of siltstone, sandstone, conglomerate, clay shale, and limestone fragments (Veseth and Montagne 1980).

The surface expressions of geologic formations consist of higher outcrops of the Eagle Sandstone units as "rimrocks" with colluvium and alluvial fans sloping from these uplands to the generally broad drainages that flow southeast into the Musselshell River. The valley sides typically have slopes from 8 to 35 percent grading to the relatively flat alluvial terraces.

Potential for Seismic Activity

The potential for seismic activity within the analysis area is low. There are no mapped active faults under the proposed turbine strings or substation. There are two mapped synclines within the analysis area (USGS 2007); the west syncline located about one to two miles west of the Meagher-Wheatland county line and the other syncline about 1.5 miles east of Daisy Dean Creek. The project area is located east of the belt of seismicity known as the Intermountain Seismic Belt that extends through western Montana, from the Flathead Lake region in the northwest corner of the state to the Yellowstone National Park region.

Mass Movement

Mass movement is the relatively rapid movement of geologic materials (commonly known as a slump or slide). The potential for mass movement of soil or rock primarily depends on topography and the dip of the bedding planes of the bedrock. The general topography and bedding plane dip slopes of the analysis area are relatively flat. The bedrock formations across the analysis area dip slightly southwest, thus creating a low potential for mass movement. The potential for mass movement also involves the overall shear strength of the geologic materials. The shale formation is more prone to mass movement compared to the sandstone rimrocks that are more resistant.

The area of greatest potential for mass movement is the area mapped as the landslide deposits in Sections 13 and 24 in Township 9N, Range 11E, in Meagher County and Section 19 in Township 9 N, Range 12 E in Wheatland County (**Figure 3.1-1**).

Subsidence

Subsidence can occur when voids are created in subsurface materials (sinkholes in limestone or subsurface mining) causing collapse of overlying material, or when the withdrawal of groundwater or petroleum causes geologic material to settle. The potential for the creation of voids and subsequent sinkholes within the geologic materials in the analysis area is low to nil due to the absence of limestone. No active or abandoned subsurface mines are located within the analysis area. Subsidence related to the withdrawal of groundwater or petroleum is also unlikely within the analysis area since petroleum is extracted at low to moderate rates and from consolidated bedrock formations. Groundwater pumping in the analysis area does not occur at rates and volumes large enough to cause subsidence.

3.1.2.2 Soils

The kinds of soils that have developed in the analysis area are determined by five major factors: (1) climate; (2) living organisms; (3) parent material; (4) topography; and (5) time. Three of the five factors have had a major influence on soil development in the analysis area; they are climate, parent material, and topography. The colder, semi-arid climate, combined with the relatively recent tertiary valley-fill sediments has caused soil profiles to be shallow compared to soils from warmer and wetter locales. As discussed in the Geology section, the main parent materials for the soils are shale and sandstone bedrock. In addition, topography has local influences due to the erosional downcutting and alluvial deposits associated with the main drainages that flow southeast into the Musselshell River.

Soils from four soil orders; Aridisoils, Entisols, Inceptisols, and Mollisols, have been delineated across the project area (**Figure 3.1-2**). Soils have been mapped at the soil series level, but these soil series have been grouped into Soil Orders for project level analysis. The acreage and percentage for the four major soil orders and the "Not Mapped" areas are shown in **Table 3.1-1** for the project area**.**

Only one soil series from the Aridisol soil order has been mapped within the project area because Aridisols are found mostly in very dry areas. Aridisols make up only 0.3% of the project area soils. Thirteen unique soil series from the Entisols order occur throughout the project area and make up about 9.3 percent of the total. Entisols are weakly developed soils with little or no subsurface horizonation. Entisol soils are found on very recent geomorphic surfaces (Brady 1990) including recently deposited alluvium along Daisy Dean Creek.

Figure 3.1-1 Geologic Map (White Sulphur and Ringling Quads pieced together) (**8 X 11 color**)

Figure 3.1-2 Soils Map (Showing combined Aridisols, Entisols, Inceptisols, Mollisols) (**8 X 11 color**)

TABLE 3.1-1 MARTINSDALE PROJECT AREA SOILS			
Soil Order	**No. Soil Series**	**Acres**	**% of Area**
Aridisols	1	51	0.3%
Entisols	13	1,726	9.3%
Inceptisols	3	3,111	16.7%
Mollisols	38	11,251	60.3%
Not Mapped	0	2,498	13.4%
Total	**55**	**18,637**	**100.0%**

Only three unique soils from the Inceptisol soil order occur across the project area. One of the Inceptisol soils, the Doney-Cabba loams, is the most common soil type across the entire project area, occupying about 3,111 acres. Inceptisol soils typically have a subsurface mineral horizon with some weatherable minerals that have been slightly altered or leached (USDA-SCS 1975). These soils are well drained and can produce good agricultural crops under proper management (Brady 1990). The combined Inceptisols make up approximately 16.7 percent of the project area.

Mollisols are the most common soils across the project area representing 60.3 percent of the project soils. Soils in the Mollisol soil order characteristically have a dark-colored, relatively thick, and organically rich surface horizon that developed under thousands of years of grassland vegetation (USDA-SCS 1997). Mollisol soils have natural fertility and most of the mapped Mollisol soils within the project area currently support dryland agriculture.

Soil Stability and Erodibility

The stability and potential for erosion of these soils are primarily dependent on the particle size, slope, and potential for mass movement. Fine-grained soils are more susceptible to wind and water erosion than coarser soils, and soils on steep slopes are more prone to erosion than soils located on relatively flat terrain. Steep slopes are also required for the mass movement of soils.

The Martinsdale project analysis area contains relatively flat to sloping terrain and thus has some areas with higher potential for erosion and mass movement. The steep slopes located immediately below the sandstone bluffs have the greatest potential for mass movement and associated erosion. A landslide geological area is mapped along the southern side of the upland in Sections 13 and 24 in Township 9N, Range 11E, in

Meagher County and Section 19 in Township 9 N, Range 12 E in Wheatland County (**Figure 3.1-1**).

Compaction, roads, and rutting

The degree to which soils may become compacted from farming and construction operations is primarily dependent on the surface soil grain size, the mineral composition of the soil, and the moisture content. Soils with high silt and clay content are more susceptible to becoming compacted than sandy soils under the same moisture conditions. Moist soils are more prone to compaction for all soil texture and mineral types. Dry soils are less susceptible to compaction than wet soils, but dry soils produce more dust that is eroded by wind. Many of the soils within the Martinsdale project area have fine-loamy surface soil textures and will be prone to compaction by construction equipment, if adequate soil moisture is present. This may be especially true with cement trucks delivering concrete for turbine tower base foundations.

Roads are best constructed on soils with coarse-grained surface soil textures, compared to soils with surface soils with fine-grained textures. Many soils in the Martinsdale project area have loam to clay-loam surface soil textures and may not be suitable for building temporary or permanent roads. Most of the project roads can be sited to avoid crossing unsuitable soils; however, some roads will need to cross steeper sloped terrain in order to access the upper flat benches.

Revegetation

The soils within the Martinsdale project area are mostly rated fair to good for range productivity and should support the reestablishment of range or cropland vegetation on the disturbed areas. Successful revegetation may require the addition of standard fertilizers and use of appropriate seeding methods.

3.2 Vegetation and Land Use

3.2.1 Analysis Methods and Analysis Area

Vegetation and land use in the project area (**Figure 3.2-1**) were investigated to assess impacts from construction of a wind farm. The project area is characterized by rolling hills in a rural landscape of dry, rocky grasslands, with areas of irrigated and dryland farming, grazing land, and areas covered with sagebrush and short grass plant communities.

3.2.2 Existing Environment

The state land involved is used for the seasonal grazing and crop production. Grazing generally occurs in the late summer and early fall.

The other land in the project area is primarily used for dryland and irrigated crop production, livestock grazing and the Martinsdale Colony complex.

Vegetation types were determined using National Land Cover Dataset (NLCD). Data was used to derive acreage of each vegetation type within the project area (**Table 3.2-1**). Sixty-four per cent of the project area land is agricultural. Grasslands and herbaceous plants are the predominant vegetation on about 32 percent of the land. There are small tracts of woody vegetation composed of forest (<1 percent) and shrublands (<1) in the project area. Woody vegetation is fragmented throughout and is mainly present in drainages and an occasional shelterbelt.

TABLE 3.2-1
TOTAL ACREAGE OF VEGETATION TYPES

Vegetation Type	Acreage
Deciduous forest	236.0
Evergreen forest	90.3
Shrubland	318.0
Grasslands/Herbaceous	5469.4
Pasture/Hay	544.3
Row crops	14.7
Small grains	9072.8
Fallow	1203.3

Figure 3.2-1 – Martinsdale Wind Farm Vegetation Types

3.2.2.1 Agricultural Land

Approximately sixty four percent (10,835 acres) of historical short grass prairie habitat has been converted to agricultural land. Agricultural land is actively managed to produce food, fiber, or livestock. The most common agricultural crops are winter wheat, hay, corn, and alfalfa.

3.2.2.2 Grasslands

Grasslands within the project area are grazed or hayed and include native range and improved (non-native grasses) pastures. Some of the native grassland plants present include needle and thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), bluebunch wheatgrass (*Pseudoroegneria spicata*), prairie Junegrass (*Koeleria macrantha*), Idaho fescue (*Festuca idahoensis*), plains muhly (*Muhlenbergia cuspidate*), green needlegrass (*Nassella viridula*), and blue grama (*Bouteloua gracilis*). Non-native grass species include crested wheatgrass (*Agropyron cristatum*), smooth bromegrass (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and timothy (*Phleum pratense*).

3.2.2.3 Deciduous/Evergreen Forest

Approximately 0.5 percent of the project area is dominated by Ponderosa pine (*Pinus ponderosa*) forest. Ponderosa pine occurs on a variety of elevations (Arno 1979), where soils are shallow and poorly developed (Pfister et al. 1977). Other overstory trees observed along the major drainages and along the slopes and tops of higher bluffs include lodgepole pine (*Pinus contorta*), juniper (*Juniperus communis*), and willows (*Salix spp*.).

3.2.2.4 Shrublands

Shrublands occur within approximately two percent of the project area (318 acres). Dominant shrub species in the proposed Martinsdale Wind Farm project area are Big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), Black hawthorn (*Crataegus douglasii*), Skunkbush sumac (*Rhus trilobata*), current (*Ribes cereum*), Woods rose (*Rosa woodsi*), buffaloberry (*Shepherdia canadensis*), and snowberry (*Symphoricarpos albus*). Though shrublands represent a small portion of the overall area, this vegetation community provides important habitat for wildlife species and structural diversity to the landscape.

3.2.2.5 Rare Plant Populations

Rare plants are plant species that may easily become endangered or extinct in a State (Fertig 1994). A review of the Montana Natural Heritage Program (MTNHP) database identified 10 rare plants that occur in Meagher and Wheatland Counties (**Table 3.2-2**). However, sites that would be affected by the wind turbine pads, access roads, and underground electrical collection transmission lines have low potential to provide suitable habitat for rare plants due to the extent of habitat disturbance from agricultural activities.

TABLE 3.2-2
RARE PLANTS FOR WHEATLAND AND MEAGHER COUNTY, MONTANA

Scientific Name	Common Name	Global/State Rank	Habitat
Adoxa moschatellina	Musk-root	G5/S2	Moist, shaded sites
Cirsium longistylum	Long-styled thistle	G3/S3	Open habitats that receive full to partial sun
Eleocharis rostellata	Beaked spikerush	G5/S2	Calcareous sites
Goodyera repens	Northern rattlesnake-plantain	G5/S2S3	Dry to moist forest
Juncus hallii	Hall's rush	G4G5/S2	Dry to wet boggy meadows
Lesquerella klausii	Divide bladderpod	G3/S3	Open shale slopes and gravelly areas
Phlox kelseyi var. missoulensis	Missoula phlox	G2/S2	Open, exposed, limestone-derived slopes
Polygonum austiniae	Austin's knotweed	G5T4/S2S3	Dry to moist flats or banks
Salix serissima	Autumn willow	G4/S2	Permanently saturated soils
Stellaria crassifolia	Fleshy stitchwort	G5/S1	Moist or wet meadows

Source: Montana Natural Heritage Program

3.2.2.6 Noxious Weeds

Noxious weeds are defined as plants that grow out of their native range and are competitive, persistent, and potentially destructive to the area they inhabit (James et al. 1991). Noxious and invasive plant species are aggressive species that have a competitive advantage over native plant species, especially on disturbed areas. Therefore, all areas subject to disturbance by the project are at risk for establishment of noxious or invasive plant species. Establishment of weed species in an area is a concern and can have negative impacts such as displacement of native plant species, reduction in plant diversity, loss of wildlife habitat, reduction in livestock forage, increased soil erosion, and increased costs to local counties. The Meagher County weed list includes 14 species (**Table 3.2-3**). Wheatland County does not have a county weed list (MDAG 2005).

TABLE 3.2-3
DECLARED NOXIOUS WEEDS
FOR MEAGHER COUNTY, MONTANA

Scientific Name	Common Name
Artemisia absinthium	Absinth wormwood
Hyoscyamus niger	Black henbane
Arctium minus	Burdock
Verbascum thapsus	Common mullein
Reseda lutea	Yellow mignonette
Matricaria maritima	Scentless chamomile
Knautia arvensis	Field scabious
Cardus nutans	Musk thistle
Sonchus aevensis	Perennial sowthistle
Conium maculatum	Poison hemlock
Onopordum acanthium	Scotch thistle
Centaurea niger	Black knapweed
Silene vulgaris	Bladder campion
Cirsium vulgare	Bull thistle

3.3 Fish and Wildlife Resources

3.3.1 Analysis Methods and Analysis Area

Fisheries within the Martinsdale Wind Farm project and particularly Daisy Dean Creek may include Brook trout and Yellowstone Cutthroat trout species in short reaches that have more perennial flows.

The wildlife resources within and adjacent to the project area were described using a range of tools such as: literature review; queries of Montana Natural Heritage Program and Montana FWP databases and vegetation community GIS layers; and careful review of the Martinsdale Wind Power Project Wildlife Assessment Report (RWC 2008). The methods used in the wildlife assessment report include: point counts, aerial and pedestrian raptor nest surveys, road surveys for raptors, pedestrian transects, literature review, agency interviews, employment of bat echolocation detectors, and incidental observations.

3.3.2 Existing Environment

Five vegetation communities that provide habitats for wildlife occur within the project area. These include: ponderosa pine forest, short grass prairie, dry-land farm, sagebrush steppe, and riparian (**Figure 3.2-1**). Distribution of documented fish and wildlife species is discussed by major types after the five habitat descriptions.

Ponderosa Pine

Approximately 0.5 percent (90.3 acres) of the project area is dominated by ponderosa pine forest. Species observed in this habitat type were gray partridge, dusky grouse, golden eagle, rock pigeon, mourning dove, great horned owl, common nighthawk, Steller's Jay, pinyon jay, Clark's nutcracker, black-billed magpie, common raven, mountain chickadee, red-breasted nuthatch, white-breasted nuthatch, rock wren, American Robin, European Starling, yellow-rumped warbler, western meadowlark , and pine siskin. Big game species observed in this habitat were Rocky Mountain Elk and black bear. Other typical species to use ponderosa pine forest habitat include cavity nesters such as: mountain bluebird, American kestrel, great horned owl, and northern flicker. Other common wildlife species of this habitat include North American porcupine, western wood peewee, and chipping sparrow.

Short Grass Prairie

Short grass prairie habitat in the project area is dominated by non-native, invasive species such as: Cheatgrass (*Bromus tectorum*) and Crested Wheatgrass (*Agropyron crisatum*). Thirty-two percent (5,469 acres) of the project area is short grass prairie.

Species observed were gadwall, American Widgeon, mallard, northern shoveler, northern pintail, gray partridge, greater sage grouse, sharp-tailed grouse, turkey vulture, northern harrier, red-tailed hawk, ferruginous hawk, golden eagle, American Kestrel, peregrine falcon, prairie falcon, sandhill crane, long-billed curlew, Franklin's Gull, ring-billed gull, California Gull, mourning dove, common nighthawk, northern flicker, western kingbird, eastern kingbird, black-billed magpie, American Crow, common raven, horned lark, tree swallow, northern rough-winged swallow, bank swallow, cliff swallow, barn swallow, canyon wren, mountain bluebird, American Robin, clay colored sparrow, vesper sparrow, white-crowned sparrow, red-winged blackbird, western meadowlark, yellow-headed blackbird, and Brewer's blackbird. Other species commonly found in Short Grass Prairie habitat include: prairie falcon, peregrine falcon, pronghorn antelope, Richardson's ground squirrel, and white-tailed jackrabbit.

Sagebrush Steppe

Sagebrush steppe occupies approximately two percent of the project area (318 acres) in the northern and western portions that are closer to the foothills of the Little Belt Mountains. Big sagebrush (*Artemisia tridentata*) is the dominant species in this community with an understory dominated by graminoid species. Species observed in this habitat were: greater sage grouse, northern harrier, red-tailed hawk, golden eagle, mourning dove, western kingbird, eastern kingbird, clay-colored sparrow, Brewer's Sparrow, white-crowned sparrow, and western meadowlark. Wildlife species known to predominantly use the sagebrush habitat at the site include: greater sage grouse, clay-colored sparrow, Brewer's sparrow, white-crowned sparrow, and mountain cottontail.

Riparian

Riparian communities can include: woodlands, willow/shrub habitat, tall emergent marsh, and short emergent marsh. There are riparian communities within and adjacent to the project area, along the North Fork of the Musselshell River and along Daisy Dean Creek. The riparian areas comprise approximately 1.4 percent of the project area (236 acres). Riparian habitat along the Musselshell River is dominated by cottonwoods (*Populus* spp.) with a willow (*Salix* spp.), choke cherry (*Prunus virginiana*), and emergent wetland vegetation understory. Riparian vegetation along Daisy Dean Creek is typically dominated by willow species but also occasionally dominated by other shrub species such as snowberry (*Symphoricarpos* sp.) or buffaloberry (*Shepherdia canadensis*).

In addition, there are also tall emergent wetlands dominated by cattails (*Typha*), sedge (*Carex* spp.) and open water habitat in isolated areas along Daisy Dean Creek corridor.

Many species of songbirds and swallows use the project site's riparian habitat. Species observed in this habitat were: Canada Goose, gadwall, American Widgeon, mallard, blue-winged teal, cinnamon teal, northern shoveler, northern pintail, green-winged teal, common merganser, great blue heron, bald eagle, northern harrier, golden eagle, American Kestrel, American Coot, sandhill crane, killdeer, American Avocet, long-billed curlew, Wilson's snipe, Wilson's phalarope, rock pigeon, belted kingfisher, western wood peewee, willow flycatcher, eastern kingbird, tree swallow, violet green swallow, northern rough-winged swallow, bank swallow, cliff swallow, barn swallow, American Robin, gray catbird, cedar waxwing, yellow warbler, yellow-rumped warbler, northern water thrush, common yellowthroat, western tanager, lark sparrow, savannah sparrow, song sparrow, red-winged blackbird, yellow-headed blackbird, Brewer's Blackbird, brown-headed cowbird, and Bullock's Oriole. In addition, many waterfowl species use those areas with open water and some nest near the stream edges in riparian cover, including: mallard, American widgeon, gadwall, cinnamon teal, blue-winged teal, green-winged teal, northern pintail, and common merganser. Other wildlife species that take advantage of the food and shelter provided by riparian habitat include: white-tailed deer, mule deer, muskrat, raccoon, and garter snakes.

Dryland Farm/Farm Field

Much of the historical short grass prairie habitat has been converted to farm fields – approximately sixty four percent (10,835 acres). The primary farm crops on the site and in the vicinity are winter wheat, corn and hay. These fields do not represent native habitat, however, they do provide habitat elements that are used by some wildlife species. The species richness of farm fields is less than that of the native habitats. Wildlife species that use the farm fields on site include sandhill crane, long-billed curlew, gray partridge, horned lark, killdeer, brownheaded cowbird, and pronghorn antelope.

Fish

Aquatic habitats in the project area include Daisy Dean Creek, various unnamed intermittent and ephemeral streams, small reservoirs and stock ponds. There are fish in Daisy Dean Creek and the Musselshell River. Daisy Dean Creek runs northwest to southeast through the project area and the Musselshell River is mostly south of the project area.

The Montana Fish Information System was reviewed for potential fisheries for the Daisy Dean Creek and the Musselshell River. Fish species documented to occur in Daisy Dean Creek include: Brook trout (*Salvelinus fontinalis*) and Yellowstone cutthroat

trout (*Oncorhynchus clarkii bouvieri)* (documented in south fork of Daisy Dean Creek). The Musselshell River is a viable fishery and provides habitat for approximately 38 native and non-native fish species. Brook trout are considered common, widespread, and abundant, and Yellowstone Cutthroat Trout are considered a species of concern by the Montana FWP and Montana Natural Heritage Program.

Mammals

The project area has a diversity of vegetation communities and, thus, habitat for a variety of wildlife species. Wildlife habitat and populations have been relatively stable in the region.

During the planning and design phase of the project, Martinsdale Wind Farm L.L.C. contracted Ranchland Wildlife Consultants, Inc. to complete a wildlife assessment (RWC 2008) (**Appendix A).** Ranchland calculated a potential impact index (PII) and completed baseline avian, wildlife, habitat, and sensitive species studies for the project area during the spring and fall months of 2007. General wildlife observations were noted and the following mammal species were documented within or adjacent to the project area: badger, black bear, red fox, coyote, porcupine, Richardson's ground squirrel, elk, mule deer, white-tailed deer, pronghorn antelope, and white-tailed jackrabbit.

Big Game

The project area is mapped by the Montana FWP as providing year-round habitat for at least six big game species: mule deer (*Odocoileus hemionus*), American pronghorn (*Antelocapra americana*), Rocky Mountain elk (*Cervus elaphus*), white-tailed deer (*Odocoileus virginianus*), mountain lion (*Puma concolor*) and black bear (*Ursus americanas*).

During the wildlife assessment studies, five species of big game animals were observed within or near the project area: mule deer, American pronghorn, Rocky Mountain elk, white-tailed deer, and black bear. Observed mule deer showed a seasonal movement pattern and were abundant during the months of February and March during what appeared to be the late winter and spring green-up period. Mule deer numbers dropped off in April and a small local population stayed during the fawning period. Mule deer observations were closely linked to the ponderosa pine and riparian habitats in the project area.

Antelope were the most consistently abundant big game species observed on or adjacent to the project area during the survey period with an average of 56 antelope observed per month. A black bear sow with cubs was observed on two occasions during the month of June, and two cow elk were observed in the pine habitat on one occasion during the first week in June. Both the black bear and elk observations were

linked with the timbered pine habitat in the project area. White-tailed deer observations were few and limited to the riparian habitat along Daisy Dean Creek.

The Montana FWP conducted an aerial survey of wildlife in the project area and in a one-mile buffer area. The survey was completed on February 20, 2008, to assist in determining the areas of greatest importance as winter range. Animal observation results are shown graphically on **Figure 3.3-1** and provided numerically in **Table 3.3-1**.

TABLE 3.3-1
ANIMALS OBSERVED DURING THE AERIAL SURVEY OF THE MARTINSDALE COLONY (February 20, 2008)

Species	Total Number Observed (Project Area and one-mile Buffer)	Number within Project Area
Antelope	234	110
Mule Deer	47	13
White-tailed Deer	110	90
Golden Eagle	1	0
Coyote	2	0
Canada Geese	8	8

Based on the Montana FWP summary of the survey (Montana FWP 2008), the majority of the antelope observed were in the northeast portion of the project area within small grain crop areas or grassland herbaceous cover. White-tailed deer were mainly observed in the central portion of the project area in association with the stream corridor and wooded areas.

Bats

The Montana Natural Heritage Program distribution maps were reviewed to determine which bat species may likely occur within the region of the project area (MNHP 2008). Potential bat species in the area include: pallid bat (*Antrozous pallidus),* Townsend's big-eared bat (*Corynorhinus townsendii),* big brown bat (*Eptesicus fuscus,* silver-haired bat (*Lasionycteris noctivagans),* hoary bat (*Lasiurus cinereus),* western small-footed myotis (*Myotis ciliolabrum),* long-eared myotis (*Myotis evotis),* little brown myotis (*Myotis lucifugus),* and long-legged myotis (*Myotis volans).* During the wildlife assessment studies, three techniques were used to determine bat composition and use of the project area (**Table 3.3-2**). They were: marine surveillance radars (MSRs), bat echolocation monitoring using ultrasound detection equipment (e.g., bat detectors), and thermal infrared (TIR) cameras. A drawback of MSRs is the inability to distinguish between birds and bats.

Figure 3.3-1 Wildlife Observations, February 20, 2008 Flight (11X17)

One technique for detecting and distinguishing birds from bats is thermal infrared imaging (TIR) (Kunz *et al.* 2003). However, there are drawbacks to this methodology, including high cost and a very small viewshed. Bat surveys were completed in the spring (8.5 hours over two days, May 31 and June 1), and fall (8.454 hours over three days, August 30 and September 2 and 3) of 2007 in bat foraging and higher use areas but away from likely turbine locations.

TABLE 3.3-2
INTEGRATED ACOUSTIC, THERMAL INFRARED CAMERA AND RADAR MONITORING FOR BATS AND BIRDS AND TIR DETECTIONS, MARTINSDALE WIND RESOURCE AREA

Date	Monitoring			Possible		Detections/Hr	
	Span	Hours	Detections	Birds[1]	Bats[1]	Birds	Bats
May 31	2030-0030	4.0	0	Unk	0	-	0
June 1	2000-0030	4.5	20	Unk (3)	6 (3)	-	1.3
Aug 31	1933-2258	3.5	76	20 (5)	48 (1)	5.7	16.6
Sept 2	2110-2301	1.85	2465	46	177	24.9	95.7
Sept 3	2005-2311	3.1	125	26 (1)	78	8.4	25.2

[1]Number in parentheses indicated number confirmed visually or acoustically
Source: Martinsdale Wind Power Project Wildlife Assessment

Bat detections were relatively low in the summer and considerably higher in the fall (an increase of 100 fold). The increased detections in the fall suggest that bats may be migrating through the project area and adjacent areas. A total of 130 echolocation recordings were collected. One recording was collected along the Musselshell River, 15 along Daisy Dean Creek, 84 along Spring Creek, and 30 at Clear View Ranch. More than one bat species was often included in a recording. Bat species recorded in the project area at Daisy Dean Creek included: big brown bat, silver-haired bat, western small-footed bat, and little brown bat. One bat species identified in the vicinity of the project area was the California bat. This species was not expected to be found in the area. The remaining three species recorded in the vicinity of the project area were expected to be found there. Two identified species, fringed bat and spotted bat, are Montana Species of Concern. One identified species, silver-haired bat, is a Potential Montana Species of Concern.

Birds

Upland Game Birds

The project area provides habitat for a variety of native and non-native gamebirds. Native game bird species likely to use the project are include: dusky grouse (*Dendragapus obscurus*), greater sage-grouse (*Centrocercus urophasianus*), ruffed grouse (*Bonasa umbellus)*, and sharp-tailed grouse (*Tympanuchus phasianellus*). Non-native species potentially found in the project area include: gray partridge (*Perdix perdix)*, ring-

necked pheasant (*Phasianus colchicus)*, and wild turkey (*Meleagris gallopavo).* Greater sage grouse leks have been document in the vicinity of the project area. During the wildlife assessments a sage grouse lek was documented approximately three miles north of the project area. In addition, the Montana Natural Heritage Program's *Natural Heritage Tracker* identified a lek 3 miles NW of the project area that has been monitored over the last several years.

Migratory birds

There are approximately 170 migratory bird species that are likely to use the project area or adjacent areas as summer habitat, winter habitat or stop-over habitat during migration (RWC 2008). These species vary but represent species from families such as: waterfowl (*Anatidae),* gallinules and coots (*Rallidae)*, plovers (*Charadriidae),* sandpipers (*Scolopacidae*), gulls (*Laridae)*, hawks (*Accipitridae*), flycatchers (*Tyannidae*), swallows (*Hirundinidae*) eagles, falcons etc., and sparrows (*Emberzidae*).

Migratory birds are protected under the Migratory Bird Treaty Act of 1918. Unless permitted by regulations, the Act provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not.

Many migratory birds were observed during the wildlife studies (RWC 2008). Pairs of sandhill cranes were frequently observed dispersed along Daisy Dean Creek, indicating a likelihood that there were sandhill crane nests along the creek corridor. In addition, although no long-billed curlew nest was found, four pairs were observed on a daily basis in the farm fields and grasslands of the project site. It is likely that the curlews nested in those habitats as well.

The Judith Gap Wind Energy Center (JGWEC) is located approximately 14 miles east of the Martinsdale Wind Farm Project and represents similar habitats. Results of grassland breeding birds surveys conducted in 2003 and 2007 in the JGWEC area indicated that the two most common grassland bird species were the horned lark and the McCown's longspur (*Calcarius mccownii).* Other common species included: vesper sparrow (*Pooecetes gramineus*), western meadowlark (*Sturnella neglecta*), and the sprague's pipit (*Anthus spragueii*).

The two most commonly observed species in the Martinsdale project area were horned lark and vesper sparrow. The Ranchland point counts on the project area found that horned larks (16.5%), vesper sparrows (15.2%), western meadowlarks (14.4%) and red-winged blackbirds (14.3%) constituted about 61% of all birds seen.

Raptors

The project area provides habitat for a variety of raptors. Resident and migrant raptors observed in or adjacent to the project area during the wildlife assessment studies include: golden eagles (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), northern goshawk (*Accipiter gentilis*), bald eagle (*Haliaeetus leucocephalus*), and red-tailed hawk (*Buteo jamaicensis*). Although there is burrowing owl habitat in the project area none were observed. Forty burrows having a potential to be used by burrowing owls were mapped.

The wildlife studies provided a variety of raptor observations. The number of raptors seen on the prescribed survey route increased by 80 percent from the breeding season to the post-fledging season. Observations of golden eagles decreased from the breeding season, suggesting that many of the eagles were nesting outside of the project area. Red-tailed hawks increased only slightly, while Northern harriers and American kestrels increased noticeably. Most of the post-fledging increase can be attributed to American kestrels, which represented 43 percent of all raptor observations.

Thirty-seven percent of all raptor observation took place in the northeastern quadrant – the area of the "east butte" and adjacent habitat. Red-tailed hawks, golden eagles and American kestrels were present in nearly equal numbers. During spring migration there were a few more golden eagles than the number seen during the breeding season, but the magnitude of change between the seasons does not indicate any major spring migration phenomena. Surveyors found two golden eagle nests, one ferruginous hawk nest, three kestrel nests and a northern harrier nest. Also, although no nest was found, observed goshawk behavior along daisy Dean Creek suggested a possible nest.

Reptiles and Amphibians

Numerous reptiles and amphibians could be found in the project area. A list of the most common reptiles and amphibians that might be found is in **Table 3.3-3**.

TABLE 3.3-3
REPTILES AND AMPHIBIANS POTENTIALLY IN THE PROJECT AREA

Common Name	Scientific Name	Habitat
Reptiles		
Tiger Salamander	*Ambystoma tigrinum*	Slow moving aquatic systems within a variety of habitats
Greater short-horned lizard	*Phrynosoma hernandesi*	Short grass or sagebrush habitats, sparse with exposed soils.
Painted turtle	*Chrysemys picta*	Shallow lakes or ponds with exposed logs or rocks available.
Western hognose snake	*Heterodon nasicus*	Floodplains within grassland or sagebrush.
Plains garter snake	*Thamnophis radix*	Typically short grass prairie, often near water.
Common garter snake	*Thamnophis sirtalis*	Variety of habitats, often near aquatic environments
Gopher snake	*Pituophis catenifer*	Grassland and sagebrush habitats
Amphibians		
Plains Spadefoot	*Spea Bombifrons*	Bodies of water with sandy/gravel soils
Western Toad	*Bufo boreas*	Low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes, to high elevation ponds, fens, and tarns at or near tree line.
Woodhouse's Toad	*Bufo woodhousii*	Floodplains for perennial, slow moving streams within grasslands
Western Chorus Frog	*Pseudacris triseriata*	Grasslands or wetlands adjacent to ponds or reservoirs.
Columbia Spotted Frog	*Rana luteiventris*	Open water located within forest openings or wetlands at or near the tree line.
Northern Leopard Frog	*Rana pipiens*	A variety of aquatic habitats: ponds, streams, wetlands

Source: Montana Natural Heritage Program

3.4 Visual Resources

This section describes the existing environment of the area where an observer could see the Martinsdale wind Farm Project.

3.4.1 Analysis Methods and Analysis Area

The area analyzed for visual resources is the area from which the proposed wind farm would be visible. The analysis area was established by using a specific distance of 10 miles from the outer boundary turbines (**Figure 3.4-1**).

Data and information for this section were compiled and refined from a variety of sources and verified by ground reconnaissance during April, June, and September of 2008. During the first site visit, the general site layout and landscape character were observed. The next visit was to take photographs from various locations in the visual analysis area. Night time photographs of the Judith Gap Wind Energy Center were taken during the September trip. Aerial photographs were used to identify residential locations.

3.4.2 Existing Environment

The wind farm would be situated in a remote rural portion of eastern Wheatland County and western Meagher County (**Figure 3.4-1**). The majority of the wind turbines would be located in Wheatland County. The general area is characterized by rolling hills in a rural landscape of dry, rocky grasslands, areas of irrigated and dry land farming, grazing land, and areas covered with a mixture of sagebrush, bitterbrush, and bunch grasses. Dry-land and irrigated croplands cover 64 percent of the project area and grasslands and herbaceous plants cover 32 percent. Small areas of woody vegetation composed of forest and shrublands cover the rest of the project area.

The turbines would be placed on open ridge tops in the rolling hills just above the Musselshell River, where strong northwest winds accelerate as they pass through the valley over the rolling hills. Currently, a road network exists throughout the project area. It is anticipated that most of the roads needed to build and service the proposed wind farm would be an incremental improvement of the existing road network. The necessary roads would likely be leveled and widened. Roads between wind turbines would be built for site preparation and turbine installation.

Figure 3.4-1

The visual setting of the wind farm analysis area consists of rolling hills, ridges, and flat benches containing dryland and irrigated crops, CRP fields, and native grasslands; the riparian area associated with Daisy Dean Creek; Highway 12; existing wind turbines, overhead power lines, a substation, and the Martinsdale Hutterite Colony (**Figure 3.4-2**). Also included in the analysis area are additional wind turbines on private land, the town of Martinsdale, the Martinsdale Reservoir, the Musselshell River, a Musselshell River fishing access site, and secondary road 294 (**Figure 3.4-2**). In addition, although the Judith Gap Wind Energy Center is located out of the visual analysis area, it can be seen during the daytime if the light is right and at nighttime because of the lights on the turbines (**Figure 3.4-1** and **Appendix B**).

Figure 3.4-2

3.5 Noise

3.5.1 Analysis Methods and Analysis Area

The analysis area for noise is the area within 1 mile of the wind turbines. The analysis area was established by using a specific distance from the outside turbines.

3.5.2 Existing Environment

There are no known studies of ambient noise levels in the project area. Currently, noise in the project area is typical of a rural setting. Sources of ambient noise include vehicular traffic, agricultural farm equipment, farm animals, weather disturbances, occasional aircraft, and natural sources such as wildlife and wind. Because the project site and surrounding areas are rural, sources of loud noises are few most of the time, and ambient noise levels are likely between 38 and 48 decibel A-weighted sound level (dBA) under calm wind conditions (EPA 1978). These noise levels are similar to those experienced in libraries or residential living rooms and are characterized as being very quiet.

The Martinsdale Hutterite Colony lies within the project area and supports approximately 140 full-time residents living in apartments and other housing units. The Colony provides their own schooling and family/residential necessities.

There are no other non-Colony sensitive human noise receptors (schools, hospitals, or daycare centers) in the vicinity of the project area. Noise-sensitive receptors in the project area are limited to the Colony and 2 or 3 other rural residences. The Colony housing units would be approximately 2,000 feet from the nearest planned turbine at full build out. The closest non-Colony residences are over one mile west of the nearest planned turbine at full build out (**Figure 3.5-1)**.

Figure 3.5-1 Noise Analysis Area

3.6 Aviation

3.6.1 Analysis Methods and Analysis Area

The analysis area for aviation is the project area including a one-mile buffer on the north, south, and west sides and approximately a 20-mile buffer on the east side in order to include the Harlowton airport. The analysis area was established in general by using the one-mile buffer distance from the outside turbines.

3.6.2 Existing Environment

The only airport in the vicinity of the Martinsdale Wind Farm is the Wheatland County Airport located approximately 1 mile northwest of Harlowton and approximately 19 miles east of the wind farm. The primary runway at this facility is a 4,200-foot-long paved runway oriented east to west, although there is a secondary gravel runway oriented north to south. This airport is used primarily by small single and twin engine private aircraft, although it is occasionally used by life flight helicopters and fixed wing aircraft. There are approximately 500 to 600 takeoffs and landings per year at the airport (Dwight Thompson, Wheatland County Airport Manager, pers. communication, October 22, 2008, Mike DaSilva, Tetra Tech).

The nearest commercial airport is located in Lewistown, Montana, approximately 55 miles northeast of the wind farm. The Lewistown/Fergus Municipal Airport has three runways. The main runway (7/25) is 7,500 feet long. The secondary runway (12/30) is 4,100 feet long, and the third runway (2/20) is 5,400 feet long. The Lewistown Airport is used by commercial aircraft, of which Big Sky Airlines is the primary carrier. Big Sky operates four flights a day at the airport. The United Parcel Service (UPS) also flies one plane out of the airport twice a day, six days a week. During the summer months, the U.S. Bureau of Land Management (BLM) operates a fire dispatch center at the airport and maintains three fixed wing aircraft and one helicopter at the airport. There are currently 46 private aircraft maintained at the airport, including 45 fixed-wing aircraft and one helicopter. The airport also receives some helicopter use from the U.S. Air Force Malmstrom Air Force Base (AFB) in Great Falls, Montana. On average, there are 4,000 to 5,000 takeoffs and landings per year for all commercial, military and private aircraft combined at the Lewistown Airport.

The Martinsdale area is also within a Federal Aviation Administration (FAA)-designated route between Great Falls and Billings. As a result, the project area receives more aircraft traffic than other areas. Malmstrom AFB may also occasionally fly helicopters to the missile site near the project area.

3.7 Economic Benefits and Expected Revenues

3.7.1 Analysis Methods and Analysis Area

The Jobs and Economic Development Impact (JEDI) model (Goldberg 2002) was used for analysis of the economic effects of the project.

For the contribution to local tax base, effects were determined by an increase or decrease in the annual property tax collected based on the total collected by Wheatland and Meagher counties. Income taxes are collected at the state level, not the county, therefore income tax not included.

For boom and bust economy, the project's effects were determined by an increase or decrease in the number of full-time employees compared to the total number of employed people in Wheatland County in any given year (Meagher County is only expected to be slightly affected by employment from the project). Effects were reviewed for both construction and operations.

3.7.2 Existing Environment

The proposed project is located in Wheatland and Meagher counties, Montana. The economic and social setting of the project area is similar to the counties as a whole, mostly rural and agricultural. The economic and social environment of the project area is, therefore, Wheatland and Meagher counties.

Economic effects are those related to employment, income, and taxes. Social impacts are related to the effects of "boom and bust" economies.

Economic opportunity is analyzed using jobs.

Contribution to Local Taxes

Wheatland County collected $5,202,290 in property taxes in 2007 (Langston 2008). Meagher County collected $3,642,009 during the same period.(Walker 2008).

Boom and Bust Economy

"Boom and bust" is a term used to describe an economic cycle where there is growth and prosperity followed by retraction and tough economic times. During boom times, there is an increase in job opportunities and wages are good. During a bust, those jobs disappear, wages decline, and unemployment increases. These declines are painful and extend beyond the newly-unemployed to the service industries that provided for the

workers. Families and work tend to relocate in search of self-sufficiency. There may be more demands on social and support services.

Table 3.7-1 shows the employment in Wheatland and Meagher Counties for 1990, 2000, and estimated for 2008. Both counties have seen slow overall increases in employment, with farming, services and government providing the majority of growth, while manufacturing has lost jobs. Construction jobs in Wheatland County have decreased, but shown a strong increase in Meagher County.

TABLE 3.7-1
WHEATLAND COUNTY EMPLOYMENT BY INDUSTRY

	Wheatland County			Meagher County		
	1990	**2000**	**2008 Estimated**	**1990**	**2000**	**2008 Estimated**
Farm and Agricultural Services	257	331	390	295	319	337
Mining	5	5	5	6	8	9
Manufacturing	76	31	0	46	60	71
Services and Professional	442	496	539	491	541	580
Construction	30	28	27	44	63	78
Government	189	212	230	159	183	202
Total Employment	999	1103	1191	1041	1174	1277

Source: Headwaters Economics 2007

2008 estimate based on average annual change between 1990 and 2000

Lease Payments

State land management has a goal of generating revenue for the school trusts. Any wind turbines constructed and operated on state land would produce payments to the state for leases. The Martinsdale Hutterite Colony would receive lease payments for all the turbines proposed to be erected on private land.

3.8 Cultural Resources

3.8.1 Analysis Methods and Analysis Area

Cultural resources are the locations of past human activity defined by artifacts, features, or architectural structures. These sites allow us to develop a better understanding of the lifeways and behaviors of early societies. Some sites may contain information important for research, public interpretation, and use by future generations. Surveys in the Martinsdale project area have recorded nine historic sites. One of these sites is recommended eligible to the National Register of Historic Places (NRHP), three sites are not recommended eligible and the eligibility of the remaining five sites is undetermined.

3.8.2 Cultural History

The project area is located within the prehistoric cultural subarea known as the Northwestern Plains, a region that extends from central Alberta to southern Wyoming and from western North Dakota to western Montana. The prehistoric inhabitants of the Northwestern Plains existed for 12,000 years as semi-nomadic hunters and gatherers. The archaeological record suggests minor changes in tool technologies and subsistence strategies over time. A primary focus on bison is evident during the last 4000 years (Frison 1971).

The prehistory of the Northwestern Plains has been classified into four traditions or periods based on similarities of artifact assemblages and overall adaptive strategies. The time periods are known as Paleoindian, Plains Archaic, Late Prehistoric, and Equestrian Nomadic.

The Paleoindian Tradition (10,000 BC-5500 BC) occurs during the Pre-Boreal and Boreal climatic episodes, a time when the climate is cool, moist and conducive to forest expansion (Bryson et al. 1970). Paleoindian populations practiced generalized foraging strategies and inhabited environmental diverse sites found in major river valleys and the foothills. Paleoindians sites are rarely found on the more homogeneous upland prairie. The Paleoindian Tradition is further classified into Clovis, Goshen, Folsom, Hell Gap-Agate Basin, Cody, and Parallel Oblique Flaked complexes.

The Plains Archaic Tradition (5500 BC-AD 250) begins during a relatively dry climatic episode known as the Altithermal. Early Plains Archaic sites are generally found in the same environment as Paleoindian sites, in the protected mountains, foothills and major river valleys. A change in subsistence and settlement strategies is seen in the middle part of this tradition when sites are increasingly found across the open prairie. Subsistence changes include an increased reliance on bison and the utilization of plant

resources. Housepits also appear for the first time in the vicinity of the Montana-Wyoming border. The final part of the Plains Archaic is characterized by additional changes in subsistence and settlement strategies. New cooperative hunting techniques are developed to more successfully exploit bison herds. The tipi is also developed which facilitates habitation of the open Plains. Complexes of the Plains Archaic include Bitterroot/Mummy Cave, Oxbow, McKean, and Pelican Lake.

The Late Prehistoric (750 BC-AD 1800) is a time of increasing specialization of plains living and utilization of plains resources, most importantly bison. The early part of the Late Prehistoric is marked by the replacement of the atlatl by the bow and arrow. This more efficient weapon, coupled with communal hunting techniques, allows the Plains Indians to become premier bison hunters. Late Prehistoric complexes include Besant, Avonlea, and Old Women's.

The Equestrian Nomadic Tradition is the transitional time between the Prehistoric and Historic periods. This tradition is distinguished by the significant changes in subsistence economies, demographics, social organization and settlement patterns that resulted from the acquisition of the horse. The horse arrived in the Southern Plains ca AD 1600 but did not appear on the Northern Plains until AD 1725-1750. With the arrival of the horse, populations became more homogenous and sedentary (Moran 1982). Mounted bison hunters could roam farther and it decreased the necessity for entire tribes to move (Secoy 1953).

3.8.3 Historic Period

Fur trappers are the first non-Indian people to arrive in Montana. In 1806, after Lewis and Clark reported on the vast numbers of fur bearing animals in the Upper Missouri area, incursions are made into Montana to identify and exploit fur resources for export to the east. John Jacob Astor and the American Fur Company grew to monopolize the fur trade of the Northern Plains and Rockies by late 1820s (Malone and Roeder 1976). Forts were established along the Missouri to facilitate trade with the Indians, act as safe depots for goods and furs and be defensible residential quarters for the traders. The principal fort was Fort Union, on the Montana/North Dakota border. Fort McKenzie and Fort Benton were constructed in Montana to accommodate trade with the Blackfoot. The fur trade was the primary focus of most Anglo-Indian activities in the Northern Plains until the 1860s when the fur trade collapsed.

Gold was discovered in southwestern Montana in 1862 at Bannock. Subsequent discoveries were made at Alder Gulch in 1863 and Last Chance Gulch in 1864. The influx of miners and other emigrants into Montana lead to mounting tensions between the whites and the Indians. In order to protect business interests and emigrants in Montana, the military constructed several forts that included Fort Benton (1865), Camp Cooke (1866), Fort Shaw (1867), Fort Ellis (1867), Forts Keogh and Custer (1877), Fort

Assiniboine (1879) and Fort Maginnis (1880) [Freedom 1984; McElroy 1954]. In 1874, gold was discovered in the Black Hills of South Dakota. The Black Hills had been given to the Teton Sioux in the Fort Laramie Treaty of 1868. Word of the discovery hit the newspapers and soon miners began pouring into the Black Hills. At first the U.S. government tried to stop the prospectors, a task which proved impossible. Treaty obligations were abandoned by 1875 and racial conflicts intensified. Battles, from small skirmishes to others that resulted in high casualties, were not uncommon in Montana. The Battle of the Little Bighorn occurred in eastern Montana in June 1876. The following year, the Nez Perce passed just east of the project area during their trek north toward Canada and escape from the U.S. military.

By the late 1870s, native peoples were confined to reservations and the Northern Plains were open to the next wave of occupants, ranchers and farmers. The cattle industry developed in the 1860s in the western valleys of Montana in response to the demand for beef in the mining camps. The industry received an additional boast in 1883 when the Northern Pacific Railroad arrived in Montana, providing access to eastern markets. The cattle business peaked during 1884-1885 and by fall 1886, the ranges were overstocked and overgrazed. The "hard winter" of 1886-1887 was extremely cold and it is estimated that 60 percent of Montana's cattle perished (Malone and Roeder 1976). The cattle industry did rebound but the days of enormous profits were gone as ranching continued on in a more conservative manner (Dale 1960).

Like the cattle business, agricultural activity began in western Montana in the 1860s and catered to the mining camps and towns. Food and supplies were initially freighted into the mining camps from Omaha, an expensive and undependable option. As many of the miners had farmed back east, it didn't take long before some of these men transitioned to farming in the western valleys. By 1870, over 54,000 acres in Montana were under cultivation.

Immigration increased at the end of the 1880s with the arrival of the Northern Pacific and the Great Northern railroads. The railroads had received huge land grants and were actively promoting the agricultural potential of Montana. Laws had also been passed by Congress that permitted settlement of public domain land. Under the Homestead Act of 1862, the Timber Culture Act (1873) and the Desert Land Act (1877), over 38 million acres of public land in Montana were patented (Hibbard 1965). Life was good for the homesteaders in the early 1900s. Rain was plentiful and grain prices were high with the advent of World War I in Europe. However, by 1919, the homesteading boom was over and the state was at the beginning of a twenty-year period of drought, wind and poverty (Malone and Roeder 1976). Over 60,000 people left Montana in the 1920s and approximately 20% of the farms were abandoned. The agricultural business needed to re-create itself before it began to recover from the hard times of the 1920s and 1930s. Land units were consolidated, crops were diversified, operations were mechanized and new scientific methods in agriculture were employed. Today,

agriculture continues to be the heart of the state's economy, providing its largest cash income and the marketing base for dozens of towns and cities (Malone and Roeder 1976).

3.8.4 Cultural Resource Surveys and Results in the Area of Potential Effect

In compliance with regulations established in the 1966 National Historic Preservation Act (NHPA), 36 CFR Part 800, seven cultural resource surveys have been conducted in the project area.

In 1985, Lahren conducted an archaeological survey of 40 acres of private land in Sec. 18, T8N R13E prior to the excavation of a gravel pit. No cultural resources were identified (Lahren 1985).

In 1987, Taylor examined 86 acres of state land in Sec. 28, T9N R12E scheduled for sale. The inventory did not identify any cultural resources (Taylor 1987).

In 1989, Passman inventoried about 0.75 mile in Sec. 30 and 32, T9N R125 prior to the installation of a buried stock water pipeline. These sections are managed by the state of Montana; no cultural resources were identified at this time (Passmann 1989)

In 1995, Ethos Consultants, Inc. examined a proposed fiber optic telephone transmission line that ran from Moore to Big Timber and Harlowton to Martinsdale. The Harlowton to Martinsdale route paralleled the north side of Highway 12. Portions in the current project area include Sec. 17 and 18, T8N R13E; Sec. 4, 5, 6, 11 and 13, T8N R12E. These sections are privately owned. Nineteen historic properties were identified. Two sites (24ME701 and 24WL148), which represent the G.L. Mutual Ditch, are located in the current project area (Dau 1995a).

In 2002, Ethos Consultants, Inc. surveyed Central Montana Communication's proposed Harlowton Telephone line upgrade within Wheatland County (Brumley and Rennie 2002). Collectively, 102 miles of proposed rights-of-way were inventoried. The only section in the current project area is privately owned, Sec. 13, T8N R12E. Ethos relocated four previously recorded sites and identified six new sites. Of these 10 sites, only 24WL58, Highway 12, is located in the current project area.

In 2004, Ethnoscience, Inc. examined 10.13 miles of Highway 12 prior to highway widening and overlay construction activities (Strait 2004). The highway bisects Sec. 18, T8N R13E; and Sec. 4, 5, 6, 11 and 13, T8N R12E in the current project area. These sections are privately owned. Nine previously recorded sites were updated and 12 new sites were recorded. Sites identified in the current project area include 24WL58, 24WL84, 24WL85, 24WL86, 24WL148 and 24WL200/24ME796.

In 2004, URS Corporation hired Aaberg Cultural Resources Consulting Service (ACRCS) to examine 14.73 miles of Highway 12 in advance of highway reconstruction activities (Wiltberger et al. 2004). Only a short segment of the highway bisects privately-owned Sec. 6, T8N R12E in the current project area. ACRCS updated seven previously recorded sites and identified nine new sites. Of these sites, 24WL84, 24WL148/24ME701 and 24WL200/24ME796 are located in the current project area.

Figure 3.8-1 shows areas inventoried with reference to the report author. These projects recorded nine historic sites that include five irrigation ditches, one highway and three highway bridges. Site 24ME701/24WL148 is the G.L. Mutual Ditch. This site winds through private and state land and it has been recommended eligible to the National Register of Historic Places. Site 24ME796/24WL200 is the Settle Ditch. A second segment of the Settle Ditch has been designated 24WL249. These ditches wind through private land. The NRHP eligibility of all segments of the Settle Ditch is undetermined. Sites 24WL254 and 24WL255 represent the remaining two irrigation ditches and are known as the Old Flood Ditch and the Old Bair Ditch, respectively. These sites are on private land and eligibility to the NRHP has not been determined for these two ditches. Site 24WL58 is Highway 12; eligibility to the NRHP has not been determined for this site. Sites 24WL84, 24WL85 and 24WL86 are timber bridges located along Highway 12. None of these sites are recommended eligible to the NRHP. Highway 12 and the timber bridges are owned by the Montana Department of Transportation.

Figure 3.8-1 Cultural Resource Surveys

4.0 Environmental Consequences

4.1 Introduction

Environmental Consequences form the scientific and analytic basis for the summary comparison of effects presented in Chapter 2. This chapter describes the environmental consequences or effects of the EIS alternatives and the cumulative effects of concurrent and future activities within the analysis area. This chapter focuses on the following effects:

- Direct, indirect, and cumulative effects
- Adverse effects that cannot be avoided

Cumulative effects are effects of future activities near the project that are reasonably certain to occur in the foreseeable future. These types of actions may include, but are not limited to:

- population growth,
- new housing developments and subdivisions,
- infrastructure such as utilities/pipelines,
- mining operations,
- other energy developments, including other wind plants,
- logging of state and private forests,
- future agriculture practices on private land including livestock grazing.

This chapter has the following major sections:

- Predicted Attainment of the Project Objectives of All Alternatives
- Predicted Effects on Relevant Affected Resources of All Alternatives

4.2 Predicted Attainment of Project Objectives

4.2.1 Predicted Attainment of Project Objective #1

Objective #1: Lease the right to use state land for the production of wind energy and generate the maximum legitimate monetary return to the common school trust.

4.2.1.1 No Action Alternative

Under this alternative, DNRC would not issue a lease for the construction and operation of a wind farm. No additional revenue would be generated for the common

school trust and this objective would not be achieved. No public benefit would be obtained from an alternative, non-polluting energy source and the DNRC would have no authority to require mitigations or conditions for construction and operation of the facility.

4.2.1.2 Alternative A: Wind Turbines on State Land (The Proposed Action)

Under this alternative, DNRC would determine and disclose through completion of this EIS the expected environmental effects associated with wind farm development on state land. The DNRC would determine that these effects are acceptable and would enter a lease agreement with Martinsdale Wind Farm, LLC for the construction and operation of a wind farm. Completion of this lease agreement would result in the minimum annual receipt of between $36,750 (7 turbines) and $78,750 (15 turbines) for the common school trust and Objective #1 would be achieved. If the wind farm produced 15 to 30 MW at $60 per MWH, the revenue could range from $89,877 to $179,755 (MW x 8760 [hours per year] x 0.38 [capacity factor] x $60 [per MWH] x 0.03)

4.2.1.3 Alternative B: Easements on State Land

Under this alternative, DNRC would determine and disclose through completion of this EIS that expected environmental effects associated directly with wind turbine generators located on state land are unacceptable and that DNRC will only issue easements to Martinsdale Wind Farm LLC for crossing state land with roads and underground electrical collection lines. No wind turbines would be located on state land. Issuing these easements would result in the annual receipt of approximately $5,216 (easements on 13.04 acres) for the common school trust and Objective #1 would not be achieved.

4.2.2 Predicted Attainment of Project Objective #2

Objective #2: Manage the rangeland for the desired future condition characterized by a healthy native plant and wildlife community.

4.2.2.1 No Action Alternative

Under this alternative, no wind farm development would occur on state land. The state land would remain characterized by healthy native plant communities and healthy wildlife populations. Objective #2 would be achieved through selection of the No Action alternative.

4.2.2.2 Alternative A, Wind Turbines on State Land (The Proposed Action)

Under this alternative, state land would be developed for the production of wind energy. Placement of up to7 to 15 wind turbines and associated roads and underground electrical collection lines would eliminate approximately 13.51 to 22.46 acres of native short grass prairie within 3,080 acres of state land. Approximately 99% of the range on state land would remain undisturbed by the project. Existing land use of livestock grazing and recreational use would continue. A nominal amount of displacement of local plant and wildlife species would be expected due to the construction and operation of the wind farm. Wind turbines are expected to kill up to a maximum of 4.62 birds and 13.4 bats per tower per year and have little additional effect on migratory populations. Objective #2 would be achieved through selection of the Alternative A.

4.2.2.3 Alternative B, Easements on State Land

Under this alternative, easements would be issued to cross state land with roads and underground electrical collection lines. Roads would eliminate approximately 10.1 acres of native short grass prairie within 3,080 acres of state land. Approximately 99% of the range on state land would remain undisturbed by this alternative. Existing land use of livestock grazing and recreational use would continue. Objective #2 would be achieved through selection of the Alternative B.

4.3 Predicted Effects of all Alternatives on Relevant Resources

4.3.1 Geology and Soil Resources

4.3.1.1 No Action Alternative

Potential adverse impacts to geology and soils under the No Action alternative include increased gravel mining at two local pits, increased soil erosion and offsite sedimentation, soil compaction and rutting, decreased reclamation potential, and contaminated soils from accidental construction equipment fuel spills and leaks. The gravel materials needed for this project would likely be mined from two Martinsdale Colony existing gravel pits. The gravel pits have approved reclamation plans through the Montana DEQ, Industrial and Energy Minerals Bureau and the increased mining would be reclaimed under those State approved plans.

Increased soil erosion and offsite sedimentation have the highest potential to occur during construction. Clearing the vegetation, stripping the topsoil, new road construction, and trenching operations cause the most terrain disturbances and thus, have the greatest potential for soil erosion. Construction activities during the rainy

season may create offsite erosion and sedimentation impacts to drainages and creek channels. New roads would need to be constructed under the wind turbine strings and may traverse some areas with steep slopes and potentially unstable soils. Martinsdale Wind Farm LLC would implement best management practices to minimize or eliminate these potentials.

Soil compaction and rutting may potentially occur during construction activities from heavy equipment and trucks traversing across non-road areas. Some of the existing two-track farm roads are deeply rutted indicating the potential for soil erosion associated with roads within the project area. Wet soils are more susceptible to compaction and rutting, thus the construction equipment and trucks should be restricted to travel on only upgraded roads, especially during the spring and early summer months when rainfall is more common. No specific soil types within the project area are substantially more susceptible to soil compaction. If soil compaction occurs during construction, it may be necessary to deep-rip these areas to relieve the compaction.

Decreased reclamation potential may occur around the turbine sites where soils are disturbed during excavation and construction activities. The sites soils have developed horizons or layers with specific properties necessary to support self-perpetuating plant communities. In particular, the uppermost soil horizon (commonly called the topsoil) contains the greatest amount of organic matter and important plant nutrients. The lack of adequate topsoil salvage or mixing of the topsoil with the underlying soil materials may cause changes in the soils' important properties and reduce the long-term reclamation potential for these disturbed areas.

Construction of the wind farm would involve the use of large motorized equipment and trucks. Accidental spills or leaks of fuels and fluids may occur and could cause impacts to soils in those areas. In addition, construction equipment and vehicles dedicated to the project site for longer periods would require routine service maintenance (oil changes, etc.). If a centralized project staging and equipment parking area is designated, the topsoil should be salvaged and stockpiled from that area prior to its use. This staging and parking area would be reclaimed after construction use by deep ripping to relieve compaction, redistributed the salvaged topsoil, and reseeding with native grasses or returned to dryland cropping.

Most of the geology and soil impacts associated with the No Action alternative would be temporary and short-term and associated directly with the wind farm construction activities. The upgrading of the existing roads to 22-feet wide and the new construction of 34-feet wide access roads would be long-term disturbances and may remain beyond the life of the wind farm. Landslides areas have been mapped for the study area (U.S. Geological Survey, 2007) and identify areas in Sections 13 and 24, T9N, R11E in Meagher County and in Section 19, T9N, R12E in Wheatland County (**Figure 3.1-1**).

Road construction and underground electrical collection line trenching can be sited to avoid crossing these potential unstable soils and geology. Most project roads can also be sited to avoid crossing steep-slope areas (15 to 35% slopes); however some roads will need to cross the steeper slopes in order to gain access to the upper flat benches. An estimated 2.45 miles of roads (10.1 acres of private land) would cross soils with 15 to 35% slopes under the No Action alternative.

Approximately 476 acres of soils would potentially be impacted under the No Action alternative (**Table 4.3-1**). Approximately 181 acres of soils would support project roads and turbine tower structures through the life of the project and are considered permanent impacts to soils under this Alternative analysis. The remaining 295 acres of soils would have temporary or short-term impacts associated with the wind farm construction activities. A summary of the disturbed soil acreages associated with the turbines, roads, and underground electrical collection lines by soil orders is provided for the No Action alternative in **Table 4.3-1**.

TABLE 4.3-1
NO ACTION ALTERNATIVE – SUMMARY OF DISTURBED SOILS

Soil Order	Turbines	Roads	Underground Electrical Lines	Totals by Orders
Aridisols	0.00	0.00	0.30	**0.30**
Entisols	22.63	5.93	4.08	**32.64**
Inceptisols	19.27	12.28	4.32	**35.87**
Mollisols	222.14	94.00	36.31	**352.45**
Soils Not Mapped	30.46	18.92	6.07	**55.44**
Totals	**294.50**	**131.13**	**50.78**	**476.41**

The majority of potential impacts to soils are associated with the temporary 4.5-acre size excavation and laydown areas around each wind turbine (445.5 acres). Approximately 4 acres at each turbine site would be regraded and reclaimed after construction with the remaining approximate ½ acre turbine tower base removed from cultivation for the life of the project. Upgrading existing roads to 22 feet wide and constructing new 34-feet wide access roads would potentially disturbed approximately 131 acres. These roads would remain through the end of the project. The underground electrical collection trenches would temporarily impact up to 51 acres. However, the soils over the trenches would be regraded and reclaimed soon after their disturbance. **Figure 3.3-2** shows the locations of the soil orders across the project site. The dominant soils are Mollisols which have developed under grass vegetation and are generally high in fertility and are productive soils. Reclamation of the temporarily disturbed areas around each turbine tower base and on top of the trenches should be successful with implementation of topsoil stripping/salvage and redistribution, and the use of standard revegetation practices.

To reduce the effects of construction, all temporarily disturbed areas would be reclaimed as part of standard BMPs. Construction and reclamation activities would incorporate standard BMPs such as the use of silt fencing, straw bales, proper-sized culverts, and ditch blocks. Construction of new roads and upgrading existing roads would use BMPs like drain dips, water bars, and properly sized culverts to control erosion and offsite sedimentation. New access road construction should avoid traversing steep slopes. Soil compaction would be limited to the staging and equipment parking areas and the crane pads at each turbine tower site. These pads would be about 50 feet by 50 feet and located on relatively flat ground. The BMPs for wind farm construction and operations include reclamation of the disturbed areas to preconstruction conditions.

Construction BMPs would require the design and use of staging areas and fuel spill cleanup kits so the potential effects of uncontained fuel spills would be low. The Montana Department of Environmental Quality will require the submission of a Storm Water Pollution Prevention Plan to minimize impact to soil resources. The No Action alternative project itself is not expected to substantially contribute to the direct impacts to soils because of the temporary nature of most of the soil disturbances. In addition, the use of standard BMPs and other project mitigations would reduce the potential impacts to soils associated with the project.

4.3.1.2 Cumulative Effects of the No Action Alternative

Past, present, and reasonably foreseeable future actions identified in Section 2.5 were reviewed for potential cumulative impacts on geology and soils. Cumulative impacts to geology and soils in Meagher and Wheatland County areas could result from existing and expanding farm operations, new roads, construction of future wind farms, expansion of the Judith Gap Wind Energy Center, new or expanded sand, gravel, and concrete operations, and other land disturbances that involve vegetation clearing, excavation, and trenching. The magnitude of these impacts depends primarily on the project size, erosion potential of the soils, and local terrain where the projects occur. The No Action alternative project is not expected to substantially contribute to the cumulative impacts to soils because of the temporary nature of most of the soil disturbances. In addition, the use of standard BMPs and other project mitigations would reduce the potential impacts to soils associated with the project.

4.3.1.3 Alternative A - Proposed Action

Impacts to geology and soil resources associated with Alternative A – the Proposed Action would be similar in kind to those associated with the No Action alternative; however, the magnitude of the potential impacts would be greater under Alternative A because 27 additional wind turbines would be built over a larger area. An additional 81 acres of soils would be temporarily disturbed and 13.5 acres of soils permanently

disturbed from the construction of the 27 additional turbines. In addition, an additional 33.8 acres of soils would be permanently disturbed by road construction and an additional 8.4 acres of soils temporarily disturbed from underground electrical collection line trenching activities. In total, approximately 599 acres of soils would be disturbed under Alternative A (**Table 4.3-2**) compared to 476 acres under the No Action alternative (**Table 4.3-1**). The duration of the impacts to geology and soil resources under Alternative A would be similar to the No Action alternative.

Approximately 228 acres of soils would support project roads and turbine tower structures through the life of the project and are considered permanent impacts under this Alternative analysis. The remaining 371 acres of soils would have temporary or short-term impacts associated with the wind farm construction activities. A summary of the disturbed soil acreages associated with the turbines, roads, and underground electrical collection lines by soil orders for Alternative A is provided in **Table 4.3-2**.

TABLE 4.3-2
ALTERNATIVE A – SUMMARY OF DISTURBED SOILS

Soil Order	Turbines	Roads	Underground Electrical Lines	Totals by Orders
Aridisols	0.00	0.00	0.30	**0.30**
Entisols	22.63	11.11	4.20	**37.93**
Inceptisols	36.55	21.45	5.50	**63.50**
Mollisols	267.89	109.45	41.85	**419.19**
Soils Not Mapped	48.21	22.91	7.33	**78.45**
Totals	**375.27**	**164.92**	**59.17**	**599.36**

Similar to the No Action alternative, the bulk of the soils impacted are Mollisols which are productive soils and should be easy to reclaim if topsoil is stripped and redistributed and standard revegetation practices are used. Alternative A roads would cross approximately 3.35 miles (18.1 acres) of soils with 15 to 35% slopes. An estimated 1.9 miles (8 acres) would be located on state land and 2.45 miles (10.1 acres) would be on private land under Alternative A. Limitations for road construction across these areas would include the slope, shrink-swell, frost-action, soft underlying bedrock, and caving of cutbanks that could increase erosion. All temporarily disturbed areas would be reclaimed to as part of standard BMPs. Construction and reclamation activities would incorporate standard BMPs such as the use of silt fencing, straw bales, proper-sized culverts, and ditch blocks.

4.3.1.4 Cumulative Effects of Alternative A - Proposed Action

The cumulative effects of Alternative A to geology and soils would be very similar to those described for the No Action alternative except that about 77 more acres would be

temporarily disturbed and about 48 more acres of soils would be permanently disturbed under Alternative A.

4.3.1.5 Alternative B, Easements on State Land

Impacts to geology and soil resources associated with Alternative B – only Easements on state land would be similar in kind to those associated with the No Action alternative and Alternative A. There would be slightly fewer acres of soils potentially impacted under Alternative B compared to Alternative A because the 7 to15 wind turbines to be located on state land would not be constructed. For this alternative analysis, the same length and widths of roads and same length of underground electrical collection lines would be required for Alternative B as for Alternative A.

Compared to the No Action alternative, Alternative B would potentially disturb an additional 76 acres of soils temporarily and 13.5 acres of soils permanently from the construction of the 27 additional turbines and 4.2 additional miles of underground electrical collection line trenching. In total, approximately 578 acres of soils would be disturbed under Alternative B (**Table 4.3-3**) compared to 599 acres under Alternative A and 476 acres under the No Action alternative. The duration of the impacts to geology and soil resources would be similar under all three alternatives. A summary of the disturbed soil acreages associated with the turbines, roads, and underground electrical collection lines by soil orders for Alternative B is provided in **Table 4.3-3**.

TABLE 4.3-3
ALTERNATIVE B – SUMMARY OF DISTURBED SOILS

Soil Order	Turbines	Roads	Transmission Lines	Totals by Orders
Aridisols	0.00	0.00	0.30	**0.30**
Entisols	22.63	11.11	4.20	**37.93**
Inceptisols	29.02	21.45	5.50	**55.97**
Mollisols	257.65	109.45	41.85	**408.94**
Soils Not Mapped	45.08	22.91	7.33	**75.32**
Totals	**354.37**	**164.92**	**59.17**	**578.45**

4.3.1.6 Cumulative Effects of Alternative B, Easements on State Land

The cumulative effects of Alternative B to geology and soils would be similar to those described for the No Action alternative except that about 77 more acres would be temporarily disturbed and about 48 more acres of soils would be permanently disturbed under this Alternative. The cumulative effects for Alternative B would be essentially the same as those for Alternative A except that 21 fewer acres of soils would be impacted because 7 turbines would not be constructed on state land.

4.3.2 Vegetation and Land Use

4.3.2.1 No Action Alternative

In this alternative there would be 99 turbines; 72 on dryland farm areas, 25 on grassland, 1 on irrigated farm land, and 1 in a juniper-pine area.

Under the No Action alternative, there would be no wind turbines, access roads, or underground electrical collection lines on state land. Current uses of state land would continue and there would be no direct impacts to vegetation on state land.

On the private land, the existing land uses of livestock grazing, dryland crop production would continue with minor modification to accommodate the placement of wind turbines. A small reduction in the number of animal unit months (AUMs) associated with livestock grazing would occur due to the removal of approximately 35 acres of grazing land. A reduction of 66 acres of cropland would result in slightly lower grain production. Construction of the 99 turbines would permanently impact approximately 186 acres of privately-owned land comprised of native and introduced grasslands, pine and juniper forested areas, and agricultural land. Indirect impacts to vegetation from the No action Alternative could include a change in vegetative species composition, vegetation growth and productivity, and related soil impacts that could impede plant root growth and access to water and nutrients. The use of dust control measures for high traffic access roads would reduce impacts from dust on nearby vegetation communities. The required early detection and use of appropriate control measures for noxious weeds would minimize weed introduction and infestation from construction. The use of standard BMPs, surveys for rare plants, and timely revegetation of the temporarily disturbed areas would reduce the potential impacts to vegetation and land use.

4.3.2.2 Cumulative Effects of the No Action Alternative

Cumulative impacts to land use and vegetation could result from existing and expanding farm operations, new roads, construction of future wind farms, expansion of the Judith Gap facility, new or expanded sand, gravel, and concrete operations, and other land disturbances that involve vegetation clearing and removal. The magnitude of these impacts depends primarily on the project size, duration, and vegetative resources where the projects occur. To ensure rare plant populations in the project area are protected, a request was submitted to the Montana Natural Heritage Program (MNHP) to inquire if there are known populations of rare plant species in the project area. None were reported. If rare plant species are found in the project area, a survey would be conducted and any rare plants would be delineated and flagged using a GPS unit. Construction workers would be instructed to avoid these identified areas.

Because there are no foreseeable future actions that would result in increased development in the project area, no additional changes in land use are anticipated at this time. The No Action alternative by itself would not be expected to substantially contribute to the cumulative impacts to vegetation and land use because only about 181 acres (1/2 acre around each turbine and 131 acres of roads) of vegetation would be permanently removed from supporting vegetation and its current use by the 99 turbines on private land. The use of standard BMPs, surveys for rare plants, and timely revegetation of the temporarily disturbed areas would reduce the potential impacts to vegetation and land use.

4.3.2.3 Alternative A, Wind Turbines on State Land

In this alternative there would be 126 turbines; 77 on dryland farm areas, 47 on grassland, 1 on irrigated farm land, and 1 in a juniper-pine area.

Under Alternative A, state land would be reclassified from the current designation of grazing land to the land classification "other" which allows for a predominant use as a wind farm. The existing grazing use of the parcels would continue but would be subordinate to use as a wind energy site. The 13.51 to 22.46 acres occupied by wind turbines and additional roads would cause a small reduction of approximately 3 to 6 AUMs. Some disruption of seasonal grazing activities may occur during construction. Post construction wind energy production and livestock grazing are expected to be compatible.

Construction of the 126 turbines, access roads, and underground electrical collection lines, clearing, grading, or trampling of vegetation from vehicle and human traffic would cause temporary and permanent impacts to existing vegetation. Temporary impacts to vegetation would be short term (one to five years) disturbances associated with the 10-foot-wide trenching of the buried electrical collection lines and the 4.5 acres of land temporarily disturbed around each of the turbines during construction. An estimated 228 acres of vegetation would be permanently displaced (for the life of the project).

Short grass prairie and agricultural land are the vegetation communities that would be most impacted under Alternative A. These permanent impacts to vegetation would result from constructing the 34-foot-wide access roads along each turbine string and the upgrading of roads between turbine strings to 22 feet wide. Other permanent vegetation impacts would be associated with the 0.5-acre concrete foundation area at each of the turbines. Indirect impacts to vegetation from Alternative A would be essentially the same as for the No Action Alternative. The required early detection and use of appropriate control measures for noxious weeds would minimize weed introduction and infestation from construction. The use of standard BMPs, surveys for rare plants, and timely revegetation of the temporarily disturbed areas would reduce

the potential impacts to vegetation and land use. More than 98% of the project area would remain undisturbed by the project.

4.3.2.4 Cumulative Effects of Alternative A, Wind Turbines on State Land

Cumulative effects to land use and vegetation under Alternative A would be similar in kind as described for the No Action alternative except that about 96 more acres would be temporarily disturbed and about 42 more acres of vegetation would be permanently disturbed. The required early detection and use of appropriate control measures for noxious weeds would minimize weed introduction and infestation from construction. The use of dust control measures for high traffic access roads would reduce impacts from dust on nearby vegetation communities.

Alternative A by itself would not be expected to substantially contribute to the cumulative impacts to vegetation because only 228 acres of vegetation would be permanently disturbed during the operation of 126 wind turbines (18,637 acres). As with all project alternatives, a request for known rare plant populations was submitted to the MNHP and if any rare plant species are found in the project area, a survey would be conducted and all rare plants would be delineated and avoided.

4.3.2.5 Alternative B, Easements on State Land

In this alternative there would be 119 turbines; 72 on dryland farm areas, 40 on grassland, 1 on irrigated farm land, and 1 in a juniper pine-area.

Under Alternative B, no wind turbines would be built on state land but the state would grant easements for access roads and power line burial. Construction would temporarily disturb 59.15 acres and there would be 10.1 acres of permanent disturbance for access roads. This would cause a slight reduction of approximately 2.5 AUMs. Some disruption of seasonal grazing activities may occur during construction. Post construction, wind energy production and livestock grazing are expected to be compatible.

The types and lengths of access roads and underground electrical collection lines would be the same as under Alternative A so the impacted acres of vegetation would also be the same. The use of appropriate measures to control the introduction and infestation of noxious weeds, dust impacts to nearby vegetation, and the avoidance of any impacts to rare plant populations would be the same for Alternative B and for the other two alternatives.

4.3.2.6 Cumulative Effects of Alternative B, Easements on State Land

Cumulative impacts to land use and vegetation from Alternative B would be similar to those described for Alternative A.

Alternative B by itself would not be expected to substantially contribute to the cumulative impacts to land use and vegetation because only 224.5 acres of vegetation would be permanently disturbed during the operation of 119 wind turbines across the project area. As with all project alternatives, a request for known rare plant populations was submitted to the MNHP and if any rare plant species are found in the project area, a survey would be conducted and all rare plants would be delineated and avoided.

4.3.3 Fish and Wildlife Resources

4.3.3.1 Environmental Consequences

Construction and operation of this project will have direct and indirect environmental effects on fish and wildlife. The direct effects will be either short or long-term effects. Short-term effects are defined as temporary deviations from existing conditions, typically lasting less than three years. Examples include disturbance related to noise, construction, road development, vehicle travel, and the loss of habitat in staging areas. Long-term effects are deviations from existing conditions that last longer than three years. Examples of long-term effects include permanent loss of habitat due to roads, turbines, substations, mortality due to collisions with turbines, and some disturbance related to vehicle travel and turbine maintenance.

Indirect effects occur later in time or farther removed from the project area, but are reasonably foreseeable. One type of indirect effect that could occur is a displacement caused increase in animal concentration, and potential competition on adjacent land. This effect could be short-term resulting from construction, or long-term resulting from the permanent loss of habitat. Another type of indirect effect is the potential change in migration or movement patterns.

The Martinsdale Wind Farm would be expected to have similar types of impacts for all alternatives with varying degrees due to the difference in size of the project under the different alternatives. The potential wildlife impacts of the construction, operation and maintenance of the wind farm are summarized below in **Table 4.3-4.**

TABLE 4.3-4
IMPACT TO WILDLIFE ASSOCIATED WITH THE MARTINSDALE WIND FARM

Project Related Activity	Potential Impacts	Duration and Extent of Impact
Impacts Associated with Construction		
Site clearing and grading; construction of footings and turbine and tower installation; access road and utility corridor construction; vehicle travel	Habitat disturbance; reduction or alteration of on-site habitat	Long-term habitat reduction within tower, building, and access road footprints; short-term reduction in habitat quality in transmission corridors and construction staging areas.
	Invasive vegetation; Reduced habitat quality	Short-term as implementation of the Weed Control Plan would control weeds in the disturbed areas.
	Direct injury or mortality associated with equipment or vehicle collisions. Would have greatest impact on wildlife with limited mobility such as amphibians, reptiles, ground dwelling birds, and burrowing mammals.	Short-term as impacts would cease upon completion of construction.
	Erosion and runoff; reduced reproductive success of amphibians using on-site surface waters; drinking water supplies may be affected.	Short-term; may extend beyond site boundaries.
	Fugitive dust generation; respiratory impairment	Short-term.
	Noise; Disturbance of foraging and reproductive behaviors; habitat avoidance.	Short-term.
	Interference with behavioral activities such as foraging, migration or reproductive behaviors; disturbance and avoidance of migratory movements.	Short-term.
Accidental spill during equipment refueling; accidental release of stored fuel or hazardous materials.	Exposure to contaminants; exposure may affect survival, reproduction, development, or growth.	Short-term and localized to spill area.

TABLE 4.3-4 IMPACT TO WILDLIFE ASSOCIATED WITH THE MARTINSDALE WIND FARM		
Project Related Activity	**Potential Impacts**	**Duration and Extent of Impact**
Impacts Associated with Operation and Maintenance		
Electric Power Lines	Electrocutions; collisions; mortality of birds and bats.	Long-term; electrocutions and collisions would be unlikely because most lines will be underground and any over head lines would be constructed using design mitigations
Turbine operation, support machinery, motorized vehicles.	Noise; possible disturbance of foraging and reproductive behaviors; habitat avoidance.	Short and long-term; greatest effect in highest noise areas.
	Collision with turbines, towers, and transmission lines; injury or mortality of birds and bats,	Long-term for many species; will affect populations to some extent.
Transmission and meteorological towers,	Predation; increase in avian predators due to more perch sites for foraging.	Long-term; may be of high magnitude for some prey species.
Accidental spill or release of pesticides, fuel, or hazardous materials	Exposure to contaminants; Exposure may affect survival, reproduction, development, or growth.	Short- or long-term, localized to spill locations,
Routine human and vehicle activities	Disturbance of nearby wildlife and bird and mammal behavior; habitat avoidance,	Short term during construction, long-term slightly more than current activities.
Erosion and runoff from poorly stabilized surface soils.	Decreased aquatic habitat quality; reduced reproductive success of amphibians; wildlife drinking water supplies may be affected.	Short-or long-term and localized –potential reduced by implementation of BMPs.
Access to surrounding areas by visitors, including unauthorized vehicles, along facility access roads and utility and transmission lines.	Disturbance to wildlife habitats by foot and vehicle traffic; potential disturbance of foraging and reproductive behaviors.	Short- or long-term, in areas adjacent to the wind facility, access roads, utility corridors, and transmission corridors,

TABLE 4.3-4 IMPACT TO WILDLIFE ASSOCIATED WITH THE MARTINSDALE WIND FARM		
Project Related Activity	**Potential Impacts**	**Duration and Extent of Impact**
	Legal and illegal take of wildlife; potential disturbance of foraging and reproductive behaviors and/or reduced distribution of some wildlife,	Short- or long-term, depending on species affected and magnitude of take.
	Invasive; establishment and spread of invasive plant species by visitors, including unauthorized vehicles, along facility access roads and utility and transmission lines,	Short-term as implementation of the Weed Control Plan would control weeds within the disturbance areas.
	Fire; potential ignition by visitors, including unauthorized vehicles, along facility access roads and utility and transmission lines	Short-term or long-term reduction in habitat quality depending on the loss of native vegetation and introduction and establishment of invasive vegetation.

4.3.3.2 No Action Alternative

Habitat

The project area was evaluated in accordance with the Potential Impact Index (PII), as described in the Interim Guidelines developed by the U.S. Fish & Wildlife Service 9USFWS) (www.fws.gov/r9dhcbfa/windenergy.html). The impact assessment process included calculation of a Potential Impact Score (Score) which when ranked relative to a "worst case scenario" location evaluated in Montana, produced a PII. The PII is an indicator of relative risk to vertebrate wildlife and thus the level of impact that may be expected should the project be developed. A PII also is suggestive of rigor and scope of additional study needed.

Assumptions identified in the USFWS protocol implicit in the process are:

1. All wind farms, regardless of turbine design, configuration or placement, present potential hazards and risk to vertebrate wildlife from both an individual and population perspective.

2. Some sites present less hazard and risk to vertebrate wildlife than others.

3. No adequate and defensible information exists regarding appropriateness of the proposed wind site being evaluated, relative to impact on vertebrate wildlife. (This means that there is no other information or analysis available indicating that one site or the other would have more or less impact on wildlife.)

4. Evaluations are conducted by qualified biologists and should involve state and federal agencies who are familiar with local and regional vertebrate wildlife.

The Score for this project was 0.53. The project PII was therefore ranked as MODERATE (see the Martinsdale Wildlife Assessment in **Appendix A** for more detail). Ranking resulted primarily from diversity of habitat (cultivation, grassland, lentic and lotic systems, forests) in proximity to the proposed turbine string locations rather than observations of special status species or abundant birds and bats.

Under this alternative there would be a total of 99 turbines and 40.9 miles of roads. The construction of the turbines would temporarily disturb 445.5 acres (4.5 acres per turbine) and permanently disturb 49.5 acres (0.5 acres per turbine). The construction of the roads would permanently disturb 136.41 acres. Installation of 33.1 miles of buried transmission lines would temporarily disturb 51.03 acres. Over all, there would be 496.53 acres of habitat temporarily disturbed during the construction of the turbines and transmission lines and a total of 185.91 acres of land permanently lost from the turbine bases and roads.

Fish

Fish habitat in and adjacent to the project area would be protected from disturbance activities associated with the No Action alternative as aquatic systems would be avoided and the implementation of BMPs, such as drilling under Daisy Dean Creek for the buried electrical collection lines, and implementing erosion control measures, would minimize any degradation of aquatic systems. Construction activities would avoid direct disturbance to all reservoirs, ponds, and creeks. BMPs would minimize impacts associated with the road construction and travel, as well as the crossing over Daisy Dean Creek. The BMPs would ensure that disturbance or degradation to fish habitat would not occur. Therefore, the No Action alternative is not expected to impact fish or fish habitat.

Mammals

Big Game

The greatest impacts to big game species would be temporary and associated with construction activities. Project implementation would temporarily and permanently remove big game habitat within the project area. Since the entire project area is mapped as year-round habitat for a variety of big game species, all disturbed acres would be considered to be within big game habitat. It is estimated that approximately 298.5 acres of habitat would become temporarily unavailable. After reclaiming and reseeding with an approved seed mix, it would likely take three to five years before these areas are restored.

Approximately 185.9 acres of big game habitat would become permanently unavailable as a result of the No Action alternative. This represents a relatively small amount of habitat available regionally. This small loss of habitat would not disrupt breeding, rearing or wintering behavior and would not influence the viability of local populations. Areas used as thermal cover in the project area, such as Ponderosa pine communities, would not be disturbed by the No Action alternative.

The noise (Section 4.3.5), habitat destruction, and other forms of disturbance related to construction would likely temporarily displace big game species in or adjacent to the disturbed areas. Construction is estimated to last nine months and expected to occur from March to November 2009. While the initial construction may displace big game species to adjacent areas, the displacement would be temporary. Upon completion of construction, big game species would become accustomed to operation and maintenance activities and would be expected to resume use of the project area.

As the construction would take place during spring to fall, wintering big game mammals would not likely be impacted during the majority of the construction timeframe. As some species may be using winter range in March or November, some impacts to wintering animals could occur; however, it is not expected to occur during crucial times when the snow on the ground is the deepest.

The potential for direct mortality of deer, elk, or pronghorn from construction activities or vehicle collision is limited. Adults are typically mobile and would be able to avoid construction equipment or vehicles (unless the vehicles were traveling at high rates of speed). Newborn fawns or elk calves are more susceptible to mortality from vehicles and construction equipment given their instinctive behavior to lie still when danger is near; however, collisions would be expected to be very rare.

Human activity, vehicle traffic and noise associated with operation and maintenance are long-term disturbances that could potentially disturb or displace deer, elk and antelope. However, given the adaptability of these species, these activities are not likely to substantially interfere with foraging, breeding, and migration activities.

The long-term effect that the wind farm would have on populations of big-game mammals is difficult to predict. Radio telemetry studies have shown that mule deer avoided oil and gas exploration sites for distances of up to one mile in Wyoming (NWCC 2004). At the Blue Canyon wind Farm in Oklahoma a study found that there was no evidence that operating wind turbines have a measurable impact on elk use of the area (Walter 2004). At the Wildhorse wind farm in Washington numerous observations of elk have noted behavior of non-alarm or distress, including resting grazing and walking (West 2007). Some mule deer may become habituated and move back into the area after construction while others may not and would avoid the project area entirely. An observational study addressing the effect of wind farms on pronghorn indicted that there was no significant difference in pronghorn abundance from pre-construction to post-construction time periods and that wind turbines did not displace pronghorns (Johnson et al. 2000). The site was primarily summer range and not winter range. The project area experiences a great deal of human activity from ranching and farming. During construction of the project the area would see an increase in activity. Although game animals may be displaced during construction, the lack of concentrated human activity post-construction would likely allow the animals to resume use of the area. It has been postulated that mule deer can avoid localized disturbances without completely abandoning their home ranges (Sawyer, 2006).

Bats

Assessing the full range of impacts to bats is challenging given the limited research on how bats respond to disturbances within their habitat. Mortality is the easiest response to monitor and there is growing research indicating that wind energy projects result in variable rates of bat mortality (Arnett et. al. 2007). A number of monitoring studies have been completed over recent years providing bat mortality estimates for wind energy projects (TRC 2008; Erickson et al. 2002, 2003a, b; Johnson et al. 2003a; Strickland et al. 2001a, b; Young et al. 2003a, b). **Table 4.3-5** summarizes the results of western and Midwestern studies. Collision mortality appears to be most important for tree-dwelling migratory bat species, based on studies done thus far (Kuvlesky, Jr. et al. 2007).

TABLE 4.3-5
BAT FATALITY ESTIMATES REPORTED AT MONITORED WIND FARMS

Wind Resource Area	State	Turbines	Bat Fatality Estimates per Turbine per Year
Buffalo Mountain	TN	3	10.0
Buffalo Ridge	MN	354	2.3
Buffalo Ridge Phase 1	MN	73	0.07, 0.26, 2.02
Buffalo Ridge Phase 2	MN	143	1.78, 2.02
Buffalo Ridge Phase 3	MN	138	2.04, 2.32
Foote Creek Rim	WY	69	1.04, 1.34
Judith Gap	MT	90	13.4
Nine Canyon	WA	37	3.21
Stateline	OR/ WA	454	0.95
Vansycle	OR	38	0.74
Wisconsin	WI	31	1.1

Multiple values were included if there were results from more than one study.
Sources: TRC 2008 Erickson et al. (2002, 2003a,b); Johnson et al. (2003a); Strickland et al. (2001a,b); Young et al. (2003a,b).

The Judith Gap Wind Energy Center (JGWEC), approximately 20 miles east of the Martinsdale Project area, was completed in October of 2005. Bird and bat mortality surveys for the 90 turbine project were completed during the fall 2006 and spring 2007 migration periods (TRC 2008). The results of the JGWEC monitoring are particularly useful in anticipating the impacts of the Martinsdale Wind Farm Project as these projects are relatively close to each other and occur in similar habitats. For the JGWEC, estimates of total fatalities and fatalities per turbine were calculated based on the number of carcasses found after adjusting for searcher efficiency and scavenger removal rates. Estimated turbine related fatalities at JGWEC during the study period were 1,206 bats (13.40 bats per turbine). This rate is somewhat higher compared to results of other studies in the western U.S, and may be higher than the rate projected for this project because the turbine density at JGWEC is greater than that proposed for the Martinsdale Wind Farm Project.

Potential bat mortality estimates were calculated based on the average mortality rates observed at other monitored wind energy projects (**Table 4.3-5**). Given the proximity to this project, and the similarity in habitat, the high bat mortality rate observed at JGWEC may represent the mortality rates to be expected for this project. Based on the bat fatalities at Judith Gap, bat mortality rates for the No Action alternative may be about 1,327 annually.

Species most likely to be feeding at the height of the blades include big brown bat, spotted bat, silver-haired bat, hoary bat, western long-eared myotis, little brown myotis, and Townsend's big-eared bat (RWC 2008). Of these, hoary bats may be particularly vulnerable to blade strikes or tower collisions because they are not very maneuverable (Williams et al. 2001). In a review of mortality studies, hoary bats were found to be the most commonly killed species of bat by a large majority (61.7 percent). To a much lesser extent other carcasses identified at wind farms included silver-haired bats, big brown bats, and little brown myotis (Kuvlesky, Jr. et al. 2007). The JGWEC monitoring suggests that greatest risk of collision fatality in this area is borne by the hoary bat as they were the most common species observed during the carcass searches followed by the silver-haired bat (TRC 2008). It is also noteworthy that the majority of the bat carcasses observed at JGWEC were discovered during the late summer (97 percent). This finding is consistent with other studies that also found the highest bat mortality is with fall migratory tree roosting species (Erickson et al. 2000; 2003; 2004; Fielder et al. 2007; Kens and Kerlinger 2004; Jain et al. 2007).

Impacts to bats associated with the Martinsdale Wind Farm project would mainly be related to collisions with blades and flying close to the blades where the sudden drop in air pressure causes internal trauma to their lungs (barotrauma) (Baerwald et al., 2008). While some disturbance and displacement may occur as a result of the wind farm activity, the displacement to adjacent habitat would not have a long-term impact. Since there is a wide range of annual bat mortality rates documented at the various wind energy projects, it is difficult to accurately predict what the rates would be for the Martinsdale project and what impact that mortality would have on the regional populations. Therefore, potential impacts to bat populations could be avoided through the implementation of mitigation measures (Monitoring and mitigation measures would be discretionary under the No Action Alternative). Monitoring would be conducted when migrating bats are most likely to be present (July/August and early September [RWC 2008]). The Martinsdale Wind Farm developer would fund an operational monitoring program to directly estimate the impacts of the wind farm on birds and bats. A monitoring protocol is located in **Appendix C**. Due to the implementation of the mitigation measures, negative impacts to local bat population would be minimized under the No Action alternative. A compilation of mitigation measures that could be implemented to reduce potential impacts to bats and other fish and wildlife species is provided in **Appendix D**.

Birds

The Martinsdale Wind Farm project would result in impacts to birds (both migratory and resident) that use the project area. The degree of the impacts would vary depending on habitat use and flight behavior. Impacts related to collisions are a concern and pose a threat to most birds that use the project area. Fatality monitoring from many wind energy projects in the country is summarized in **Table 4.3-6**.

TABLE 4.3-6
AVIAN FATALITY ESTIMATES REPORTED AT MONITORED WIND FARMS

Wind Resource Area	State	Turbines	Avian Fatality Estimates per Turbine per Year
Altamont Pass	CA	5,400 7,340	0.3 to 0.9 0.05 to 0.1
Buffalo Ridge	MN	354	2.8
Buffalo Ridge Phase 1	MN	73	0.3 to 0.7, 1.0
Buffalo Ridge Phase 2	MN	143	2.3
Buffalo Ridge Phase 3	MN	138	4.5
Foote Creek Rim	WY	69	1.5, 1.8
Green Mountain (Searsburg)	VT	11	0
IDWGP (Algona)	IA	3	0
Judith Gap	MT	90	4.5
Klondike	OR	161.4	1.4
Mountaineer	WV	44	4
Nine Canyon	WA	37	3.6
Princeton	MA	8	0
San Gorgonio	CA	2,900	2.3
Somerset County	PA	8	0
Stateline	OR/ WA	454	1.7
Vansycle	OR	38	0.6
Wisconsin	WI	31	2.8

Multiple values were included if there were results from more than one study.

Sources: TRC 2008 : Curry and Kerlinger (2004a,b); Erickson et al. (2001, 2002, 2003a,b); Johnson et al. (2002, 2003a); Kerns and Kerlinger (2004); Osborn et al. (2000); Smallwood and Thelander 2004; Strickland et al., (200la,b); Thelander and Rugge (2001); Young et al. (2003a).

Using the annual avian fatality rates listed in **Table 4.3-6,** the No Action alternative could potentially result in about 5 to 445 bird fatalities each year. However, the result from the JGWEC may provide a better insight when estimating the potential fatality rates for this project. Fatality estimates for the JGWEC were calculated for three size classes of birds per turbine, per year: small birds (3.8 fatalities), large birds (0.69 fatalities), and raptors (0.14 fatalities). Using these rates, the No Action alternative could potentially result in 376.2 small bird fatalities, 68.3 large bird fatalities, and 13.9 raptor fatalities annually.

As the construction of the wind farm will begin in March and continue through November, there is a potential for construction to disrupt birds that are nesting or rearing their young. This could prevent the birds from nesting entirely or cause nest or chick abandonment. This impact would most likely be short-term and associated with the construction of the turbines and roads. However, nest and young abandonment may also occur long-term as the increase in human activity associated with the maintenance of the turbines and roads could cause abandonment in future nesting seasons.

Mitigation measures would be implemented to reduce the impacts on birds. Martinsdale Wind Farm LLC will fund an operational monitoring program to directly estimate the impacts of the wind farm on birds and bats. The operational monitoring plan for the project will consist of the following components:

- Fatality monitoring, for a minimum of two years within the Phase I project area and a minimum of one year on the Phase II site (March 15 – November 15th), using standardized carcass searches and carcass removal and searcher efficiency trials; and a protocol for handling and reporting of fatalities and injured wildlife for the life of the project;

- Surveying, for a minimum of two nesting periods post-construction, for golden eagle and ferruginous hawk nests within 2 miles of the Phase I and II wind turbines on lands Martinsdale Wind Farm, LLC can legally access;

- Using a Technical Advisory Committee of the various stakeholders to review methodologies and results and make recommendations regarding the need to modify existing methods and the desirability of additional monitoring beyond the effort described in this plan.

- The principal of adaptive management will be applied to the operating monitoring program to allow refinement of fatality surveying techniques.

Rationale for Not Conducting Displacement Studies of Grassland Birds

We are currently not recommending studies of the breeding grassland bird displacement at the Martinsdale project for several reasons. Several studies have been conducted in the western U.S. that have estimated displacement effects for several of the most common species expected on this site. The grassland resident species most common on the site (horned lark) has been shown from other studies not to be displaced by wind turbines (Erickson et al. 2004, D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication). Horned larks appeared least impacted, likely because this species prefers areas of bare ground such as those created by turbine pads and access roads (Beason 1995).

A long-term grassland bird displacement study at a wind energy facility in South Dakota found that chestnut-collared longspur (*Calcarius ornatus*) and western meadowlarks did not appear to avoid turbines, whereas grasshopper sparrows (*Ammodramus savannarum*) appeared to avoid turbines out to a distance of 656 ft (200 m; D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication). McCown's longspur, a species potentially similar in behavior to the chestnut-collared longspur and western meadowlark are also two of the more common grassland songbird species expected at the project site.

Therefore, it doesn't appear that much additional information will be gained from these studies. In addition, the Phase I site is relatively small, so a study on Phase I in grassland habitat will likely not have enough statistical power and sample size necessary to determine the level of displacement. It may be possible to implement a displacement study for the Phase II site, if it is determined by the DNRC to be warranted at that time. One factor in making that decision would be the availability of additional studies of displacement of breeding grassland songbirds residing at the Martinsdale project. If it is determined that such a study is warranted for Phase II, it is imperative that at least one year of pre-construction data is collected using methods identified in the Judith Gap monitoring plan or those used by Erickson et al. (2004) and D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication be employed.

Upland Game Birds

The No Action alternative could potentially impact upland game birds by temporarily and permanently removing nesting habitat. Displacement is likely, but the magnitude is uncertain. The majority of acres impacted by the No Action alternative would be in native short-grass prairie and cropland; therefore, direct impacts to nesting habitat for sage grouse or shrub/forest upland game birds would not be expected. In addition, there were no upland game bird nests or leks observed within the project area during the wildlife studies. Construction activities may temporarily disturb and displace upland game birds within the project area; however, displacement would not be

permanent. Should a previously undiscovered nest or lek exist within or near the project area, construction activities may cause the abandonment of that site.

Another concern for upland game birds is increased predation associated with increased raptor perches in the project area. Perching opportunities would be limited because initial design criteria indicate that all transmission lines would be buried.

Raptors
The greatest potential impact to raptors would be fatalities and injuries related to collisions. Thirty-seven percent of all raptors counted were in the northeastern quadrant. This quadrant also accounted for 52% of the kestrel observations. So, the greatest risk to raptors from the proposed development may occur on the east and west buttes near the Ponderosa pine timbered areas which include the northeastern quadrant. Mitigation measures and monitoring would be implemented to avoid collision and protect golden eagle and ferruginous hawk nest sites.

Reptiles and Amphibians
The construction phase of the No Action alternative would have the potential for impacting reptiles and amphibians. Due to the limited mobility of these species, they are more likely be killed or injured due to construction activities. The grading of roads and turbine sites could potentially result in some fatalities of these species. However, upon completion of the construction phase, impacts to reptiles and amphibians would be rare. Collisions with vehicles during routine maintenance may result in injuries and fatalities; however, these would be rare. Fatalities during both the construction phase and the operation/maintenance would not result in fatalities to an extent that would reduce the viability of reptile and amphibian population.

4.3.3.3 Cumulative Effects of the No Action Alternative

Historically, the primary disturbance to fish and wildlife resources in and near the project area has been associated with dryland and irrigated farming and livestock grazing. Impacts include clearing of native vegetation for conversion to cropland, the introduction of herbicides/pesticides, a reduction in herbaceous cover and the introduction of non-native plant species. Additional historical land use and disturbance activities in the region include: road development, construction of transmission lines, recreational activities such as hunting and off-road vehicle use, and the development of wind farms. The Judith Gap facility is located approximately 20 miles east of the project area. There are three private wind farms on or near the project area. One private wind farm is located near the Colony housing complex, while six turbines are across Highway 12 near the southeast corner of the project area and seven turbines are north of Highway 12 west of the Haymaker Road turnoff. These facilities are likely to continue into the foreseeable future. The impacts from these facilities include a small amount of habitat loss, some disturbance, and likely, some mortality. The cumulative

impacts to the No Action alternative would be some minimal increase in impacts; however, the total cumulative impacts would not be expected to reduce the viability of populations within the region. Mitigation measures implemented for the Martinsdale Wind Farm project would help minimize the cumulative impacts to fish and wildlife.

The No Action alternative would have no cumulative impacts to fish species or their habitat as there would be no direct or indirect impacts.

Cumulative impacts to big game would be primarily related to disturbance and loss of habitat. An increase in vehicle traffic in and near the project area would increase the likelihood of direct mortality from collisions. The overall impacts to big game are expected to be minimal over the long-term. Revegetation efforts would minimize lost habitat.

Cumulative impacts to bats would primarily be from direct mortality through collision with turbines and trauma associated with the rapid barometric pressure changes from flying near the turbine blades. With this project, added to the existing wind farms in and near the project area and the Judith Gap Wind Energy Center, mortality for bats would increase. Bats are long-lived and produce few young per year, which means that their populations could not recover as quickly from population losses.

Cumulative impacts to birds would be primarily from loss of habitat and direct mortality from collision with the turbines. Ground nesting species could be temporarily displaced and would lose potential habitat. Direct mortality would likely increase though not to the point where viability of the avian populations would be threatened. Avian species displaced by the project could relocate to other suitable areas if suitable unused habitat is available. The collision impact from past and current activities and reasonably foreseeable future actions, added to those of the proposal could cause a small reduction in population size for birds and bats. These impacts may be reduced by employing careful siting practices and other mitigation measures.

Cumulative impacts to reptiles and amphibians and their habitats include roads, disturbance from construction, and increased human activity in the area. These impacts are expected to be negligible due to the mitigation measures like revegetation and avoidance of sensitive habitats. Increased vehicle traffic could increase the chance of direct mortality.

4.3.3.4 Alternative A, Wind Turbines on State Land (The Proposed Action)

Impacts to fish and wildlife resources under the Proposed Action would be similar to those impacts under the No Action alternative. Total impacts would likely be more than the No Action alternative as there would be a total of 126 turbines constructed, which is 27 more than the No Action alternative. However, under alternative A, the DNRC could require monitoring mitigation measures that could further minimize impacts. The construction of the turbines would temporarily disturb 567 acres of land with of total of 63 acres of land being permanently lost. There would also be a total of 49.2 miles of road (165 acres of permanent disturbance) under this alternative which is 8.3 miles more than the No Action alternative. Under Alternative A, there would be 42.3 miles of buried transmission line (62.2 acres of temporary disturbance) which is 9.2 miles more than the No Action alternative (13.52 more acres of temporary disturbance).

There would be 377.2 acres temporarily disturbed under this alternative and 228 acres permanently lost. This is 75.6 acres of temporarily disturbed land and 42.1 acres of permanently lost land more than the No Action alternative.

Impacts to fish would be the same as the impacts under the No Action alternative.

Impacts to mammals would be similar to the impacts discussed in the No Action alternative. As there would be more turbines and roads constructed under this alternative, there would be slightly more impacts to mammals. Bat mortality rates for Alternative A (Proposed) would range from 8.8 to 1688.4 bats annually (**Table 4.3-5**).

Impacts to bats would be similar to the impacts discussed in the No Action alternative. As there would be more turbines, there would be slightly more impacts to bats. Under Alternative A, bat mortality rates from collisions with turbines would likely be approximately 27% greater than the expected number in the No Action alternative.

Impacts to birds would be similar to the impacts discussed in the No Action alternative. As there would be more turbines and roads constructed under this alternative, there would be slightly more impacts to birds. Under Alternative A, bird mortality rates from collisions with turbines could be about 584 annually. Using the estimates established at the Judith Gap Wind Energy Center, there could be 479 annual small bird fatalities, 87 annual large bird fatalities, and 18 annual raptor fatalities.

Impacts to reptiles and amphibians would be similar to the impacts discussed in the No Action alternative. As there would be more turbines and roads constructed under Alternative A, impacts would be slightly greater under this alternative.

4.3.3.5 Cumulative Effects of Alternative A – Wind Turbines on State Land

The cumulative effects of Alternative A would be similar to the cumulative effects under the No Action alternative. The only difference would be the increase of land temporarily and permanently disturbed under this alternative compared to the No Action alternative and the increased bird and bat mortalities associated with the additional 27 turbines.

4.3.3.6 Alternative B, Easements on State Land

Impacts to fish and wildlife habitat under Alternative B would be similar to the impacts under the No Action alternative. The effects of construction of 119 turbines (20 more than the No Action alternative) would be somewhat more than the No Action alternative. The construction of the turbines under this alternative would cause 535.5 acres of temporarily disturbance and 59.5 acres of permanent disturbance. There would be 49.2 miles of roads (165 acres of permanent disturbance) – 8.3 miles and 13.5 acres more than under the No Acton Alternative. There would be 42.3 miles of buried transmission lines under Alternative B – 62.2 acres of temporary disturbance which is 9.2 miles and 13.53 acres more than the No Action alternative.

There would be a total of 356.7 acres temporarily disturbed and 224.5 acres permanently disturbed under this alternative.

Impacts to fish would be the same as the impacts under the No Action alternative and Alternative A.

Impacts to mammals would be similar to the impacts discussed in the No Action alternative. The impacts would be slightly greater because there would be more turbines and roads under this alternative compared to the No Action alternative.

Alternative B bat mortality rates would range from 8.3 to 1594.6 bats annually (**Table 4.3-5**).

Impacts to birds would be similar to the impacts discussed in the No Action alternative. The additional turbines and roads under this alternative would cause slightly more impacts to birds. Under Alternative B bird mortality rates from collisions with turbines could about 550 birds annually. Using the estimates from at the Judith Jap Wind Energy Project, there could be 452 annual small bird fatalities, 82 annual large bird fatalities, and 16 annual raptor fatalities.

Impacts to reptiles and amphibians would be similar to the impacts discussed in the No Action alternative. More turbines and roads under Alternative B, impacts would cause slightly greater impacts than the No Action alternative.

4.3.3.7 Cumulative Effects of Alternative B– Easements on State Land

The cumulative effects of Alternative B would be the similar to the cumulative effects of the No Action alternative. The primary difference would be the increase of land temporarily and permanently disturbed under this alternative compared to the No Action alternative.

4.3.4 Special Status Species

4.3.4.1 Threatened or Endangered Species

The only federally listed species that was identified by the US Fish and Wildlife Service to that could potentially occur within the region of the project area is the black-footed ferret (*Mustela nigripes)* (USFWS 2008). The Wheatland County list for *Endangered, Threatened, Proposed and Candidate Species (http://www.fws.gov/mountain-prairie/endspp/countylists/montana.htm)* was reviewed on October 22, 2008.

4.3.4.2 Black-footed Ferret

Black-footed ferrets use open habitat used by prairie dogs such as: grasslands, steppe, and shrub steppe. The ferrets do not dig their own burrows and rely on abandoned prairie dog burrows for shelter. Only large complexes (several thousand acres of closely spaced colonies) can support and sustain a breeding population of black-footed ferrets. Black-footed ferrets formerly occurred throughout the Great Plains, mountain basins, and semi-arid grasslands coincident with prairie dogs, their primary prey item (Hillman and Clark 1980).

All known populations are a result of the reintroduction of captive bred ferrets. In 1998, a total of 217 kits were allocated for reintroduction and field breeding programs. Seventy-seven ferret kits were allocated to two separate release sites on a Montana experimental reintroduction area: 55 kits to the Ft. Belknap Indian Reservation and 22 kits to the Charles M. Russell National Wildlife Refuge. The release sites in Montana are north and east from the project area. No ferrets are currently known to occur on prairie dog towns near the project area and no current potential exists for black-footed ferrets to occur due to the absence of prairie dogs towns. There are no prairie dog colonies on the project site and there is a large distance between the project area and known distributions of prairie dogs and reintroduction sites.

This species has a recovery plan published by the USFWS and has an interagency working group/recovery team formed to facilitate recovery. The populations of ferrets released in upland habitats in eastern Montana are considered experimental non-essential populations because of their status as reintroduced animals.

There are no candidate or proposed species occurring within or near the project area.

4.3.4.3 State-Listed Sensitive Species

The Montana Department of Fish and Game, along with the Montana Natural Heritage Program, maintains a list of all animal species of concern that occur within the state. This list provides a ranking of species based on their current status within the state.

Those species discussed will be those species with a state ranking of S1 through S3.

> S1 = A high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to global extinction or global extirpation in the state.
>
> S2 = At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to global extinction or extirpation within the state.
>
> S3 = Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some parts of the state.
>
> B = Refers to the breeding population of the species in Montana.

The Montana Natural Heritage Program *Natural Heritage Tracker* database was reviewed on June 9, 2008. **Table 4.3-7** provides the state listed Species of Concern identified either within the project area or within a two-mile buffer area around the project area.

Table 4.3-8 list those Species of Concern considered to have a high potential for occurrence if the project site was within its known range and suitable habitat was available on-site or if the species was known to occur in the immediate project vicinity.

TABLE 4.3-7
SPECIES OF CONCERN DOCUMENTED WITHIN THE PROJECT AREA OR A TWO-MILE BUFFER AREA

Scientific Name	Common Name	Status	Habitat	Species Present within Project Area
Sorex preblei	Preble's Shrew	S3	Sagebrush/grasslands	Last recorded sighting 1980
Gulo gulo	Wolverine	S3	Coniferous forest	
Haliateeus leucocephalus	Bald Eagle	S3	Riparian Forest	Also protected under the Bald and Golden Eagle Protection Act. Often seen in the area
Dolichonyx oryzivorus	Bobolink	S2B	Moist grasslands	Last recorded sighting 1998
Charadrius montanus	Mountain Plover	S2B	Grasslands	Last recorded sighting 2005; Haymaker Ranch; Haymaker road at Big Coulee
Centrocercus urophasianus	Greater Sage Grouse	S3	Sagebrush	Lek surveyed in April and May of 2007, located west of project area
Calcarius mccownii	McCown's Longspur	S2B	Grasslands	East of project area, north of Two Dot
Numenius americanus	Long-billed Curlew	S2B	Grasslands	Farm fields and grasslands
Calcarius ornatus	Chestnut-collared Longspur	S3B	Grasslands	Haymaker road east of the project area
Buteo regalis	Ferruginous Hawk	S2B	Sagebrush/grasslands	Haymaker Ranch east of the project area

Source: Montana Natural Heritage Program *Natural Heritage Tracker* database: June 9, 2008

TABLE 4.3-8
SPECIES OF CONCERN WITH HIGH POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Scientific Name	Common Name	Status	Habitat
Amphibians			
Spea bombifrons	Plains Spadefoot	S3	Wetlands, floodplain pools
Bufo boreas	Western Toad	S2	Wetlands, lakes, floodplain pools
Rana pipiens	Northern Leopard Frog	S1S3	Wetlands, floodplain pools
Reptiles			
Sceloporus graciosus	Common Sagebrush Lizard	S3	Rock outcrops
Heterodon nasicus	Western Hog-nosed Snake	S2	Floodplain, friable soils
Birds			
Pelecanus erythrorhynchos	American White Pelican	S3B	Lakes
Nycticorax nycticorax	Black-crowned Night Heron	S3B	Wetland/lake with emergent vegetation
Plegadis chihi	White-faced Ibis	S1B	Wetland/lake with emergent vegetation
Buteo swainsoni	Swainson's Hawk	S3B	Sage/grassland with woody vegetation
Buteo regalis	Ferruginous Hawk	S2B	Sagebrush/grasslands
Haliaeetus leucocephalus	Bald Eagle	S3	Riparian forest
Falco peregrinus anatum	American Peregrine Falcon	S2B	Cliffs
Tympanuchus phasianellus	Sharp-tailed Grouse	S1	Grasslands
Centrocercus urophasianus	Greater Sage Grouse	S3	Sagebrush
Charadrius montanus	Mountain Plover	S2B	Grasslands
Numenius americanus	Long-billed Curlew	S2B	Grasslands

TABLE 4.3-8
SPECIES OF CONCERN WITH HIGH POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Scientific Name	Common Name	Status	Habitat
Larus pipixcan	Franklin's Gull	S3B	Wetland/lake with emergent vegetation
Chlidonias niger	Black Tern	S3B	Wetlands
Sterna caspia	Caspian Tern	S2B	Large rivers and lakes
Sterna forsteri	Forster's Tern	S2B	Wetlands
Athene cunicularia	Burrowing Owl	S2B	Grasslands
Melanerpes lewis	Lewis's Woodpecker	S2B	Riparian forest
Contopus cooperi	Olive-sided Flycatcher	S3B	Early seral forest/shrub patches
Lanius ludovicianus	Loggerhead Shrike	S3B	Shrublands
Oreoscoptes montanus	Sage Thrasher	S3B	Sagebrush
Anthus spragueii	Sprague's Pipit	S2B	Grasslands
Mniotilta varia	Black and White Warbler	S2S3B	Deciduous forests
Spizella breweri	Brewer's Sparrow	S2B	Sagebrush
Calamospiza melanocorys	Lark Bunting	S3B	Sagebrush/grasslands
Ammodramus bairdii	Baird's Sparrow	S2B	Grasslands
Ammodramus savannarum	Grasshopper Sparrow	S3B	Grasslands
Calcarius mccownii	McCown's Longspur	S2B	Grasslands
Calcarius ornatus	Chestnut-Collared Longspur	S3B	Grasslands
Dolichonyx oryzivorus	Bobolink	S2B	Moist grasslands
Leucosticte tephrocotis	Gray-Crowned Rosy Finch	S2B	Alpine
Mammals			
Sorex merriami	Merriam's Shrew	S3	Sagebrush/grasslands
Sorex nanus	Dwarf Shrew	S2S3	Rocky habitats
Sorex preblei	Preble's Shrew	S3	Sagebrush/grasslands

TABLE 4.3-8
SPECIES OF CONCERN WITH HIGH POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Scientific Name	Common Name	Status	Habitat
Corynorhinus townsendii townsendii	Townsend's Western Big-Eared Bat	S2	Caves in forested habitats
Myotis thysanodes	Fringed Myotis	S3	Riparian and dry mixed conifer forests
Euderma maculatum	Spotted Bat	S2	Arid land rock outcrops
Fish			
Onchorhynchus clarki bouvieri	Yellowstone Cutthroat trout	S2	Mountain streams, rivers, lakes

4.3.4.4 Environmental Consequences

Direct and indirect impacts to species of concern would be similar to the impacts to other wildlife species as discussed earlier In general, most impacts would occur from the loss of habitat resulting from construction and temporary disturbance during construction and maintenance of the facilities. Impacts from the all alternatives would be very similar. The No Action alternative would result in fewest turbines (99) and the least amount of disturbance. Alternative A would have 126 turbines and the most miles of roads and transmission lines. Alternative B would have 119 turbines and same number of miles of roads and transmission lines as Alternative A.

For the discussion of the impacts on the species of concern, it is assumed that there will be the fewest impacts under the No Action alternative, the most under Alternative A, and a balance under Alternative B.

4.3.4.5 No Action Alternative

Mammals

The mammal species of concern that could occur in the project area are the black-footed ferret, three species of shrew, and three species of bat. The black-footed ferret is always associated with prairie-dog colonies in grassland and shrub steppe habitat types. In Montana all known black-footed ferrets are in two reintroduced populations. Neither of these two populations are located in or near the project area. In addition to this, there are no known colonies of prairie dogs in the project area so there is no suitable habitat for the ferret. The only potential impact to black-footed ferrets from this project is the

potential loss of future habitat. No other direct or indirect impacts to black-footed ferrets would occur.

The three species of shrews that could potentially occur within the project area occur in sagebrush and grassland habitats. These species may be impacted in the short-term through displacement and direct mortality during construction activities. These species are less mobile than larger mammals and may suffer mortality through direct vehicle strikes during construction activities and normal maintenance and operational activities. Long-term impacts would result from the permanent loss of habitat. Another long-term impact may be increased predation on these species. The turbines and associated facilities and infrastructure may provide additional perches for raptors to hunt from. This would be minimized through burying transmission lines and placing anti-perching devices on towers.

The three bat species of concern that could potentially occur in the area could have both short-term and long-term impacts. These impacts would the same as the impacts that were discussed in Section 4.3.3.2.

Birds

Impacts to bird species of concern can be evaluated in terms of impacts to habitat. Species that occur in or near bodies of water generally would not have any impacts outside of direct mortality with turbines or potential disturbance during the construction of the turbines, staging areas and roads. Species like the American white pelican, terns, and ibis require bodies of water or wetland/riparian areas. These areas would generally be avoided during construction and protected through the use of BMPs where disturbance could not be avoided. Wetlands or riparian species of bird could suffer direct mortality through strikes with the turbines. Estimates of avian mortality are in Section 4.3.3.2.

Raptor species of concern that were observed or could be found in the project area include Swainson's hawk, ferruginous hawk, peregrine falcon, and the bald eagle. Impacts to these species would be limited to either direct mortality from collisions with the turbines or in the loss of feeding and foraging areas. Impacts to raptors through direct mortality are discussed in Section 4.3.3.2. The species of raptors that could potentially occur in the project area all could potentially hunt in the grasslands and farmlands that make up the majority (96%) of the project area. Short-term impacts to these raptors would occur during the construction and placement of the roads and turbines. The disturbance created by project related activities could limit the foraging areas and cause displacement. Long-term impacts would be a permanent loss of foraging habitat. An estimated 185.91 acres of land would be permanently lost due to construction activities. Another long-term impact to these species may occur from the increased human activity in the project area during operations. The increase human

activity may limit the amount of time and space available for foraging activities though to a lesser degree than during construction. As there will be no construction taking place within the forested habitats in the project area, there would be no loss of nesting or roosting habitat.

The majority of bird species of concern that could occur in the project area are those that are generally associated with grasslands and sagebrush habitats. Grassland species of birds would be most impacted in both the short-term and long-term. Short-term impacts would result from the construction activities. Construction of the turbines and associated roads is anticipated to take nine months, therefore displacement of grassland species would likely occur over the same time period. Direct mortality of grassland birds may occur during construction of the turbines and roads, however, due to the highly mobile nature of birds it is not anticipated that many individuals would be killed. Another short-term impact to grassland species habitats is possible nest abandonment. Many species of bird are particularly sensitive to harassment and may abandon nests or young should the construction get near their nest site. Nest abandonment would be most likely during the construction but could also occur in the future nesting seasons from the increase in human activity associated with operations.

Long-term impacts to grassland species would occur from the loss of nesting and breeding habitat as well as direct mortality through collisions with the turbines. An estimated 48.9 acres of grassland habitat and 118.3 acres of dryland farm habitat would be permanently lost through the construction of turbines and roadways. Estimates of bird mortality are in Section 4.3.3.2. Another long-term impact could occur from the increased human activity in the area. This disturbance could prevent these species from moving back into the area after construction. A potential long-term impact may result from increased predation. The construction of the wind turbines and associated infrastructure could provide raptors additional perches to hunt from. This impact would be minimized through the use of anti-perching devices and burying transmission lines.

Amphibians

The three species of amphibians that are species of concern that could potentially occur within the project area are typically restricted to wetlands, floodplain pools and lakes. Aquatic systems would be protected through the implementation of BMPs. Short-term impacts to these species would occur in the form of direct mortality from vehicle collisions and disturbance from construction activities. Potential long-term impacts would be a minimal loss of habitat. Mortality is not expected to threaten the viability of these amphibian populations. The impacts to amphibians would be expected to be similar under all three alternatives.

Reptiles

The western hog-nosed snake occurs in floodplain areas near water bodies and impacts would be similar to the impacts to amphibians. The common sagebrush lizard occurs in rock outcrops. This species may be impacted during construction and operation activities through direct mortality. Other impacts to this species would be the same as described earlier.

4.3.4.6 Cumulative Effects of the No Action Alternative

No past, present or reasonably foreseeable projects in the vicinity of the proposed project have been identified that would potentially affect the black-footed ferret. As the ferret is almost entirely dependent on prairie dog colonies and no such colonies exist in the area, no impacts would occur.

Cumulative impacts to other species of concern in the vicinity of the project area would be similar to those listed in Section 4.3.4.2. The past, present and reasonably foreseeable actions in the vicinity of the project area that could impact species of concern include road construction, conversion of native grasslands for dryland and irrigated farming, and recreational activities, the increase of wind turbines, and livestock grazing. Impacts would primarily occur in dryland farming areas. These areas are commonly used by grassland species. Introduction of agricultural pesticides and herbicides could negatively impact these species. Roads and recreational activities have the potential to disturb species in the area. Direct mortality would increase for the species of concern both through an increase in the potential for wildlife vehicle strikes and through bird and bat strikes with the turbines. The implementation of the mitigation measures would help offset the negative impacts to these species.

4.3.4.7 Alternative A, Wind Turbines on State Land (The Proposed Action)

The impacts to species of concern would be similar to the impacts under the No Action alternative. As there would slightly more turbines and roads constructed under this alternative, there would be a slight increase in the impacts to special status species. An estimated 75.9 acres of grassland habitat and 125.7 acres of dryland farm habitat would be lost under this alternative.

4.3.4.8 Cumulative Effects of Alternative A

The cumulative effects of Alternative A on species of concern would be the similar to the cumulative effects under the No Action alternative. The only difference would be the increased land temporarily and permanently disturbed under this alternative compared to the No Action alternative.

4.3.4.9 Alternative B, Easements on State Land

The impacts to species of concern would be similar to the impacts under the No Action alternative and Alternative A. This alternative would have 20 more turbines constructed than the No Action alternative but 7 less than Alternative A. There would be more roads constructed under this alternative than in the No Action alternative and the same amount of roads as Alternative A. An estimated 72.9 acres of grassland habitat and 125.7 acres of dryland farm habitat would be lost under this alternative.

4.3.4.10 Cumulative Effects of Alternative B

The cumulative effects of Alternative B on species of concern would be similar to the cumulative effects under the No Action alternative. The only difference would be the increased land temporarily and permanently disturbed compared to the No Action alternative.

4.3.5 Visual Impacts

This section contains:

- An evaluation of the visual character of the landscape of the proposed wind farm site including visual catchment (see below);
- Visual simulations of the proposed wind farm; and
- Potential measures to mitigate any major negative visual impacts.

4.3.5.1 No Action Alternative

Under the No Action alternative, a maximum of 99 turbines are proposed for installation on private land.

Catchment Area

At some locations within the visual analysis area (**Figure 4.3-1**), the wind farm would not likely be seen. The catchment area is the area in which a portion of the wind farm can be seen with the naked eye. The catchment area for the Martinsdale wind farm was determined using a Geographic Information System (GIS) that accessed topographic data and the wind farm model (turbine location and height) to map areas from which the wind farm would be either partially or fully visible. The GIS mapping takes into account landform features, however vegetation (specifically trees near the town of Martinsdale and near the river) were not included in the computation of the visual catchment. In addition, visibility can be affected by mist, smoke, dust, and light conditions.

Figure 4.3-1

As a result, the computed visual catchment overestimates the extent of wind farm "visual catchment". **Figure 4.3-1** shows the approximate catchment area of the proposed wind farm. The steps taken to generate this view of the catchment area are described in **Appendix B**. **Figure 4.3-1** shows the worst case catchment area (Alternative A), which includes 27 more turbines than the No Action alternative. The actual catchment area for the No Action alternative would be slightly smaller because the additional turbines in Alternative A are generally inside the outermost turbines of the No Action alternative.

Construction

Short-term visual impacts would result from ground disturbance associated with construction of the turbine pads, access roads, and transmission lines. Road development (new roads or expansion of existing roads) would introduce additional strong visual contrasts in landscape, depending on the location of the viewer, route relative to surface contours, and the width, length, and surface treatment of the roads.

Construction related traffic would be an addition to the currently occurring agricultural operation traffic. During construction there would be small-vehicle traffic for worker access and frequent large-equipment (trucks, graders, excavators, and cranes) traffic for road construction, site preparation, and turbine installation. This traffic would produce visible activity and dust in dry soils. Suspension and visibility of dust would be influenced by vehicle speeds and road surface conditions. Temporary parking for worker's vehicles within staging areas or on adjacent surfaces could produce visual contrast from suspended dust and loss of vegetation. Site development may be progressive, persisting over several months. It may also be intermittent, staged, or phased, giving the appearance that work starts and stops. There would be a temporary presence of large cranes or a self-erection apparatus to assemble and mount towers, nacelles, and rotors. All such equipment would produce emissions while operational and may create visible exhaust plumes (BLM 2005).

Ground disturbance would result in visual impacts that produce contrasts of color, form, texture, and line. Excavating for turbine foundations and ancillary structures; trenching to bury electrical distribution systems; grading and surfacing roads; clearing and leveling staging areas; and stockpiling soil and spoils (if not removed) would damage or remove vegetation, expose bare soil, and generate suspended dust. Soil scars and exposed slope faces would result from excavation, leveling, and equipment movement. Invasive species may colonize disturbed and stockpiled soils and compacted areas. These species may be introduced naturally or in seeds, plants, or soils introduced for intermediate restoration, or by vehicles. The land area or footprint of installed equipment would be small, but could be susceptible to additional disturbance and alteration over the life of the project. Successful reclamation of disturbed areas

would remove most of these visual impacts; however, the access road(s) would continue to be visible from various viewpoints. (BLM 2005)

Site Operation

The wind turbines would be placed on benches in open, flat areas where there would be little interference to wind flow and wind speeds would be the greatest. The turbines would be 80 meters (approximately 262 feet) tall at the hub and approximately 124 meters (406 feet) tall at the tip of the blades. As a result, the turbines would be visible for up to several miles from some locations and their presence would change the visual character of the area.

Daily and seasonal low sunlight conditions would likely make the towers more visible and more prominent. The wind turbines light color would make them less visible during the winter season, with less green vegetation and possible snow cover. Because of their size and exposed location, visual evidence of wind turbines cannot be avoided, reduced, or concealed; therefore, effective mitigation is limited.

During low light periods, such as early and late hours of the day and during the winter season when sun angles are low, there may be a strobe-like effect from flickering shadows cast by the moving rotors. The shadow flicker would be temporary and limited to daylight hours. The turbines would cast shadows that sweep large distances in a related effect at low sun angles. In addition, a strobe-like effect caused by the regular reflection of the sun off rotating turbine blades would likely occur at times. The blade glint would depend on the orientation of the nacelle, angle of the rotor, and the location of the observer relative to the position of the sun. Blade glint would also be influenced by the color, reflectivity, and age of the blades. This effect may be noticeable at distances of about 6.2 to 9.3 mi (10 to 15 km) and may be especially pronounced when aligned with roadways or other viewing corridors (BLM 2005).

Depending on the materials used, the maintenance buildings could produce visual contrasts (form, color, line, and texture) by virtue of reflective surfaces and resulting glare.

The Federal Aviation Administration (FAA) provides guidelines for the marking and lighting of wind farms (FAA 2007), defined as developments with more than three turbines with heights over 200 feet above ground level. Marking recommendations recognize that not all turbines within an installation need to be lighted. Guidelines specify that it is important to define the periphery of the turbine array, and that within the array no unlighted gap greater than one-half statute mile should be present. FAA rules require lights that flash white during the day and twilight and red at night mounted on nacelles. Lights should flash simultaneously and must be placed as high as possible on the turbine nacelle, so they are visible from 360 degrees. However,

recommendations on marking and/or lighting structures for aircraft safety can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design on top of the nacelle.

Although aircraft warning lights are designed to be more visible to aircraft than from the ground, the presence of the lights would cause a change in views from nearby residential areas and roadways. They would increase visibility of the turbines, particularly in dark nighttime sky conditions typical of rural areas. Because of intermittent operation, beacons would likely not contribute to sky glow from artificial lighting, however, the emission of light to off-site areas could be considerable. A rendering of the nighttime effect of the proposed wind farm would not be realistic; so, nighttime photographs of the Judith Gap Wind Energy Center (**Appendix B**) provide a reasonable idea of what the proposed Martinsdale wind farm would look like at night.

When towers, nacelles, and rotors need to be upgraded or replaced, some of the initial visual impacts of construction and assembly would be repeated. To optimize measurements (change locations) or to replace or upgrade equipment, there may be additional construction and installation of monitoring equipment causing repeated visual evidence of disturbance. Infrequent outages, disassembly, and repair of equipment may produce the appearance of idle or missing rotors, "headless" towers (when nacelles are removed), and lowered towers. This could elicit negative visual perceptions of "lost benefits" (e.g., loss of wind power) and "bone yards" (for storage) (BLM 2005).

In addition to the current agricultural operation traffic, there would be occasional small-vehicle traffic for testing, commissioning, monitoring, maintenance, and repair, and infrequent large-equipment traffic for turbine replacements and upgrades, causing dust. Suspension and visibility of dust would be influenced by vehicle speeds and road surface materials.

Photographic Simulations

Photographs with the turbines superimposed (renderings) were developed to depict the wind farm development area from four different view points (**Figures 4.3-2** through **4.3-5**). Three of these figures (**Figures 4.3-2, 4.3-4,** and **4.3-5**) were taken at lower elevations than the turbines. **Figures 4.3-2** and **4.3-3** provide renderings from viewpoint 3 from two directions. Viewpoint 3 is approximately 3.3 miles from the closest Alternative A turbine. **Figures 4.3-5** and **4.3-6** provide renderings from viewpoint 8 from two directions. Viewpoint 8 is approximately 1.3 miles from the closest Alternative A turbine. These views provide the most predominant view of the turbines. The higher view point 5 (**Figure 4.3-4**) reduces silhouetting so the turbines are less visible. Viewpoint 5 is approximately 6.4 miles from the closest Alternative A turbine. The original photographs and technical information regarding these photographic

simulations is provided in **Appendix B**. All figures showing photographic simulations show all of the turbines in Alternative A, which includes 27 more turbines than the No Action alternative.

Summary of Visual Impacts

Studies performed in the United Kingdom suggest there is a large area of visual influence for wind farms. Sinclair (2001) provides a basis for determining the potential visual impacts and area of study for wind farms. The Sinclair-Thomas matrix, based on numerous field observations of operating wind farms in the United Kingdom, identifies bands of visual influence surrounding wind farms. Sinclair suggests a wind farm with 95 meter turbine would be clearly visible with moderate impact at approximately 10 miles.

Five levels of visual influence were assigned for potential impact levels:

Proximate (0 – 1.5 miles)
High (1.5 – 4.0 miles)
Moderate (4.0 – 10.0 miles)
Low (10.0 – 14 miles)
None (14.0+ miles)

This analysis indicates that a potentially high level of visual impact can extend up to 4 miles from wind farms with 2.1 MW turbines, with moderate impacts at distances up to 10 miles.

The Martinsdale Hutterite colony and 48 residences are within 4 miles (proximate to high impact) of at least one turbine. In addition, the town of Martinsdale; portions of Highway 12, Findon Road, and Haymaker Road; and portions of the Musselshell River are within 4 miles (**Figure 3.4-2**). The turbines would likely be visible from Martinsdale and the Musselshell River when the town's trees are leafless but they would not likely be a dominant feature on the landscape. There are 55 residences between 4 and 10 miles (moderate impact) from at least one turbine.

Reactions to the turbines would likely vary. Some people would prefer the setting as it now exists without the turbines. Other people, however, may find them to be an interesting and even aesthetic point of visual interest on the landscape (Gipe 2003).

Figure 4.3-2

Figure 4.3-3

Figure 4.3-4

Figure 4.3-5

Figure 4.3-6

4.3.5.2 Cumulative Effects, No Action Alternative

Past, present, and reasonably foreseeable future actions identified in Section 2.5 were reviewed for potential cumulative impacts on visual quality. All action alternatives, when combined with past and present actions (existing towers) and reasonably foreseeable future actions (possible Judith Gap Wind Energy Center upgrade) would increase the developed character of the regional landscape for the long term.

4.3.5.3 Alternative A, Wind Turbines on State Land (The Proposed Action)

A maximum of 126 turbines are proposed for installation on both private and public land under Alternative A (**Figure 2.3-1**). An additional 27 turbines would be installed under Alternative A compared to the No Action alternative. The additional turbines would be located in the north and northwest part of the project area.

Catchment Area

The catchment area shown in **Figure 3.4-1** and discussed in Section 4.3.4.2 (No Action alternative) shows the catchment area of Alternative A, which includes 27 more turbines than the No Action alternative.

Construction

The short-term visual impacts of construction would be more than the No Action alternative. More ground disturbance associated with construction of the turbine pads, access roads, and transmission lines will occur. There would be approximately 22% more acreage disturbed under Alternative A versus the No Action alternative.

Small-vehicle traffic, dust, temporary parking for worker's vehicles, and the time it takes to assemble and mount the towers, nacelles, and rotors will all increase under Alternative A versus the No Action alternative.

Site Operation

The increased number of turbines would increase the visual impacts of the wind farm under Alternative A versus the No Action alternative. There would be more potential for shadow flickering; however, there are few residences located east and west of the wind farm where the morning and evening shadows would be most prevalent.

The maintenance building would produce the same visual impact for any alternative.

The number of wind turbines with marking and lighting would increase under Alternative A. The nighttime effect of the lighting would increase, notably looking from the north and west, and would not be appreciably noticeable looking from the east and south.

Under Alternative A, there would likely be more maintenance activities than the No Action alternative and subsequently increased visual impacts.

Photographic Simulations

The photographic simulations (renderings) were developed using Alternative A turbines (**Figures 4.3.-2** through **4.3-5**).

Summary of Visual Impacts

The visual effect of the additional turbines (compared to the No Action alternative) would increase from viewpoints looking from the north and west toward the project area. Most of the visual effects of the additional turbines would increase more than the percent increase of turbines from the No Action alternative to Alternative A when being viewed from the north and west. The visual impact of the additional turbines looking from the east and south would be less than the percent increase of turbines.

4.3.5.4 Cumulative Effects, Alternative A, Wind Turbines on State Land (The Proposed Action)

Cumulative impacts associated with this alternative would be similar to those associated with the No Action alternative except that there would be an additional 27 wind turbines.

4.3.5.5 Alternative B, Easements on State Land

Visual effects under Alternative B would be essentially the same as Alternative A but with seven fewer turbines.

4.3.5.6 Cumulative Effects, Alternative B, Easements on State Land

Wind turbines would only be installed on private land with DNRC granting easements for access roads and underground electrical collection lines on state land under Alternative B. A maximum of 119 turbines are proposed for installation on private land under Alternative B (**Figure 2.3-3**). An additional 20 turbines would be installed under Alternative B compared to the No Action alternative, seven fewer than Alternative A.

The additional turbines would be located in the north and northwest part of the project area.

The visual effects under Alternative B would essentially be the same as the effects described for Alternative A.

4.3.6 Noise

4.3.6.1 No Action Alternative

The proposed project is located in a rural agricultural area with very few sensitive noise receptors. Noise impacts in the project area during construction will be temporary and will consist of increased noise levels associated with construction activities. Construction activities associated with development of the wind farm would generate maximum noise levels of 85 to 88 dBA at a distance of 50 feet (BLM 1995). Noise would also be generated by increased traffic on area roadways. The nearest non-Colony residences are approximately one mile from the nearest proposed turbine location. It is unlikely that any residences other than the Colony residences would experience other than minor construction noise impacts.

The two possible sources of noise from operational wind turbines are mechanical noise from the gearbox and aerodynamic noise from the rotor blades. Mechanical noise has virtually disappeared from modern wind turbines due to engineering designs that minimize vibrations. Aerodynamic noise results from turbine blades moving through the air. Blade tips and back edges are currently designed to minimize aerodynamic noise. Noise from moving blades is low frequency, and is therefore less obvious to the human ear.

Noise from the turbines varies with wind speeds. The noise level for the Suzlon 2.1 MW generator is listed at 106.5 dBA. At other wind farms noise levels were found to range from 100.7 dBA at a wind speed of 6.7 mph to 104.6 dBA at a wind speed of 24.8 mph. Noise levels decrease considerably with increasing distance from the turbines. Noise from the wind will generally mask the noise generated by the wind turbines at distances greater than 1,000 feet. At a distance of approximately 0.5 mile the noise level would about 35dBA. It is anticipated that the nearest residence, located approximately a mile from the nearest turbine, would experience turbine noise levels of less than 30 dBA. To put these noise levels into perspective, noise levels of 30 dBA are comparable to a soft whisper, while noise levels of 40 dBA are typical of those in a library (Tipler 1991).

4.3.6.2 Cumulative Effects, No Action Alternative

Since there are no other developments in the project area in the foreseeable future that would result in increased noise levels, no cumulative impacts are anticipated regarding noise levels.

4.3.6.3 Alternative A, Wind Turbines on State Land (The Proposed Action)

Noise effects associated with this alternative would be similar to those for Alternative A, although noise levels would be somewhat higher due to the greater number of turbines.

4.3.6.4 Cumulative Effects, Alternative A, Wind Turbines on State Land (The Proposed Action)

Effects would be similar to but slightly greater than the No Action alternative due to the additional 27 turbines.

4.3.6.5 Alternative B, Easements on State Land

Effects with 20 additional turbines would be slightly greater than the No Action alternative.

4.3.6.6 Cumulative Effects, Alternative B, Easements on State Land

Cumulative effects would be similar to the No Action alternative.

4.3.7 Aviation Safety

4.3.7.1 No Action Alternative

Wind turbines could present a potential hazard, well beyond the boundaries of an airport, to aircraft taking off and landing. The FAA sets guidelines for how tall structures can be in the vicinity of public use airports without jeopardizing safe use of the airport. These guidelines are based on keeping objects out of airspace used for arriving, departing, and maneuvering aircraft, and are based on a set of complex slopes from various points on the airport.

The FAA provides guidelines for the marking and lighting of wind farms, defined as developments with more than three turbines with heights over 200 feet above ground level (FAA 2007). Marking recommendations recognize that not all turbines within an installation need to be lighted. Guidelines specify that it is important to define the

periphery of the turbine array, and that within the array no unlighted gap greater than one-half statute mile should be present. FAA rules require lights that flash white during the day and twilight and red at night mounted on nacelles. Lights should flash simultaneously and must be placed as high as possible on the turbine nacelle, so they are visible from 360 degrees. However, recommendations on marking and/or lighting structures for aircraft safety can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design on top of the nacelle.

Due to the proximity of the wind turbines to the Wheatland County Airport and the Lewistown Airport, and because the wind farm is within an FAA-designated route, the FAA will be consulted to determine how many turbines need to be equipped with airplane warning lights consisting of dual system red/medium intensity flashing white lights on top of the generator housing. There are no new overhead power lines associated with the project that could pose additional hazards to aircraft.

Generally, no structures are allowed which might interfere with aircraft climbing at the rate of 200 feet per nautical mile from a runway. The project site is approximately 16.5 nautical miles (About 19 statute miles) from the Wheatland County Airport runway. The prohibition on obstacle height at this distance is 3,300 feet, well above the 406-foot height of the turbines. Because the turbines are not located in an aircraft approach or takeoff zone, operators of this airport did not have any objections to the wind farm. Due to the relatively small area affected by the wind farm and distance from the nearest airport, no impacts to aviation would likely be associated with construction of the wind farm provided that lighting measures required by the FAA are implemented.

4.3.7.2 Cumulative Effects, No Action Alternative

Construction of the wind farm would result in the presence of additional structures for aircraft to avoid in the area. No additional tall structures are proposed for the project vicinity. Cumulative impacts to aviation are expected to be minimal.

4.3.7.3 Alternative A, Wind Turbines on State Land (The Proposed Action)

Effects to aviation associated with Alternative A would be very similar to those associated with the No Action alternative, although the impacts would be slightly higher due to the 27 additional turbines.

4.3.7.4 Cumulative Effects, Alternative A, Wind Turbines on State Land (The Proposed Action)

Cumulative effects would be slightly greater than those for the No Action alternative because of the additional 27 turbines.

4.3.7.5 Alternative B, Easements on State Land

Impacts would similar to those of the No Action alternative, but slightly higher because of the additional 20 turbines.

4.3.7.6 Cumulative Effects, Alternative B, Easements on State land

Cumulative effects would be similar to those of the No Action alternative, but slightly higher because of the additional 20 turbines.

4.3.8 Economic Benefits and Expected Revenues

The primary economic benefit associated with wind farm development is a dramatic increase in the tax base of Wheatland County and a lesser increase in Meagher County. Additional benefit will result from increased employment during construction and to a lesser extend during operation of the facility.

State property taxes are based on the value of the equipment. Industrial size wind farms are considered Class 13 property and are taxed at 6% of assessed value unless the developer pays the state prevailing wage. Then, the wind farm equipment would be Class 14 property, taxed at 3% of value plus the local mil levy. For example, if the capital cost of the project is $100 million, and the local levy is 400 mils, the state tax would be $3,400,000 per year ([$100,000,000 x .03] + [.004 x $100,000,000] = $3,400,000). Industrial wind farms are eligible for a tax incentive as a New or Expanding Industry as defined in 15-24-1401, MCA. This statute allows for a reduction of 50% in local government taxes for the first five years of operation contingent upon approval by the county commission. After year five property taxes increase in equal increments until the full tax is assessed in the tenth year. Martinsdale Wind Farm LLC will likely apply for this tax incentive and the Wheatland and Meagher County Commissions will likely approve this request. Until the county commissioners act the reduction in mils is not known.

The information presented below is predicated on the assumption that the counties would not change the number of mils assessed in response to the increase to the counties' taxable value. It is likely that a reduction in mils would occur and that the actual taxes paid by Martinsdale Wind Farm LLC would be less than presented. Until

the actual size of the project is determined it is impossible to estimate what reduction (if any) in the amount of mils assessed would be made.

4.3.8.1 No Action Alternative

Contribution to the Local Tax Base

When the project is completed, the JEDI model predicted that annual property taxes paid would be $785,400 (**Table 4.3-9**). Under the No Action alternative, 8 of the 99 turbines would be located in Meagher County and 91 would be located in Wheatland County. Based on a percentage, Meagher County turbines (8 percent) would generate $62,832 in annual property taxes and Wheatland County turbines (92 percent) would generate $722,568 in annual property taxes. The increase in Meagher County property taxes would be 1.7 percent. The increase in Wheatland County would amount to 14 percent.

TABLE 4.3-9
SELECTED OPERATION AND MAINTENANCE COST RESULTS OF THE JEDI MODEL FOR NO ACTION ALTERNATIVE

Annual Operating and Maintenance Costs	Cost
Personnel	$1,091,961
Materials and Services	$1,878,039
Property Taxes*	$785,400

* This amount assumes no tax reductions are applied.

Boom and Bust Economy

The JEDI model showed full-time job creation due to construction of all three phases of 287 (**Table 4.3-10**), which is an increase of 24 percent of total employment during construction for Wheatland County (estimated for 2008). During operation (2010 and later), 68 jobs (**Table 4.3-11**) would be created, an increase of 5.7 percent.

TABLE 4.3-10
ECONOMIC BENEFITS RESULTS OF THE JEDI MODEL FOR CONSTRUCTION OF THE NO ACTION ALTERNATIVE

During Construction Period	Jobs	Earnings ($ million)
Construction Sector Only	278	$9.4
Manufacturing Sector Only	6	$0.2
Other Industry Sectors	3	$0.1
Direct Impacts from Construction	**287**	**$9.8**

Notes: Earnings values are millions of dollars in year 2008 dollars. Jobs are full-time equivalent for one year.

Plant workers includes field technicians, administration and management. Non-plant workers includes jobs related to goods and services directly purchased by the plant. Economic impacts "During operating years" represent impacts that occur from plant operations / expenditures. The analysis does not include impacts associated with spending of plant "profits" and assumes no tax abatement.

TABLE 4.3-11
ECONOMIC BENEFITS RESULTS OF THE JEDI MODEL FOR OPERATION OF THE NO ACTION ALTERNATIVE

During operating years (annual)	Jobs	Earnings
Direct Impacts	40	$1,600,000
Plant Workers Only	18	$1,000,000
Non-Plant Workers	22	$600,000
Indirect Impacts	10	$300,000
Induced Impacts	18	$400,000
Total Impacts (Direct, Indirect, Induced)	**68**	**$2,300,000**

Notes: Jobs are full-time equivalent for one year.

Plant workers includes field technicians, administration and management. Non-plant workers includes jobs related to goods and services directly purchased by the plant. Economic impacts "During operating years" represent impacts that occur from plant operations / expenditures. The analysis does not include impacts associated with spending of plant "profits" and assumes no tax abatement.

The costs of construction and annual operation are shown in **Table 4.3-12**. These costs are an indication of some of the revenue that would be generated by the project.

TABLE 4.3-12
CONSTRUCTION COST RESULTS OF THE JEDI MODEL FOR NO ACTION ALTERNATIVE

Construction Costs	Cost
Materials (excluding equipment)	$23,138,578
Labor	$4,693,681
Construction Total	$27,832,259
Equipment Costs	
Turbines	$152,265,960
Blades	$50,755,320
Towers	$31,878,000
Equipment Total	$234,899,290
Other Costs	
HV Sub/Interconnection	$10,148,499
Engineering	$3,326,400
Legal Services	$257,796
Land Easements	$0
Site Certificate	$735,766
Other Subtotal	$14,468,461
Total Project Costs	**$277,200,000**

Land Values

Some people feel that construction of a wind farm in the area would cause their land values to decrease. Others feel their property values would increase. Some feel that any landowners within eyesight or earshot of the project should be economically compensated. The DNRC and the Martinsdale Colony are the only landowners in the area that would be directly affected by the project.

Property value concerns can be separated into three general categories. Concerns that the character of the area would change to be less rural and more industrialized could lower property values (area stigma); degradation of the visual qualities of the area could make it a less desirable place to reside (scenic vista stigma); and the wind turbines could be a nuisance affecting the health and well being of nearby residents (nuisance). A number studies have investigated these concerns at wind farm sites in the United States, United Kingdom, and Denmark. The results varied positive to neutral to negative. The latest research (Hoen 2008) concluded that few of the previous studies tested the results for statistical significance, none had visited homes potentially impacted, and none had been academically peer reviewed.

Hoen's research reached conclusions on all three categories of potential property value concerns. He concluded:

> Area Stigma: We find no statistical evidence that homes near wind facilities are stigmatized by those facilities as compared to other homes in the region.
>
> Scenic Vista Stigma: We find no statistical evidence that homes with a view of wind turbines have different values than homes without such views.
>
> Nuisance: We find no statistical evidence that homes within ¼, ½ and 1 mile of turbines sell for different values than those further away.

The preliminary research indicated that there could be isolated cases where property values are negatively impacted, but in the study of the data from 10 areas near more than 25 wind facilities they were not widespread or statistically identifiable.

Lease Payments

There would be no turbines on state land under the No Action alternative; therefore, it would not generate anything for the common school trust from wind turbines.

4.3.8.2 Cumulative Effects of the No Action Alternative

Because there are no foreseeable future actions that would result in increased development in the area, no additional economic impacts are anticipated.

4.3.8.3 Alternative A, Wind Turbines on State Land

Contribution to the Local Tax Base

If Alternative A is completed, the JEDI model predicted that annual property taxes paid would be $1,190,000 (**Table 4.3-13**) Under the Alternative A, 12 of the 126 turbines would be located in Meagher County and 116 would be located in Wheatland County. Based on a percentage, Meagher County turbines (9 percent) would generate $107,100 in annual property taxes and Wheatland County turbines (91 percent) would generate $1,082,900 in annual property taxes. The increase in Meagher County property taxes would be 2.9 percent, and the increase in Wheatland County would be 21 percent.

TABLE 4.3-13 SELECTED OPERATION AND MAINTENANCE COST RESULTS OF THE JEDI MODEL FOR ALTERNATIVE A	
Annual Operating and Maintenance Costs	**Cost**
Personnel	$1,654,487
Materials and Services	$2,845,513
Property Taxes*	$1,190,000

* This amount assumes no tax reductions are applied.

Tax relief under the No Action alternative may or not apply as described.

Boom and Bust Economy

For boom and bust economy, the project's effects would determined by an increase or decrease in the number of full-time employees compared to the total number of employed people in Wheatland County in any given year (Meagher County is not expected to be affected by employment from the project). Effects were reviewed for both construction and operations.

The model showed full-time job creation due to construction of all three phases of 434 (**Table 4.3-14**), which, is and increase of 37 percent of total employment during construction for Wheatland County (estimated for 2008). During operation (2010 and later), 103 jobs (**Table 4.3-15**) would be created, an increase of 8.6 percent.

TABLE 4.3-14 ECONOMIC BENEFITS RESULTS OF THE JEDI MODEL FOR CONSTRUCTION OF ALTERNATIVE A		
During Construction Period	**Jobs**	**Earnings ($ million)**
Construction Sector Only	421	$14.3
Manufacturing Sector Only	9	$0.3
Other Industry Sectors	5	$0.2
Direct Impacts from Construction	**434**	**$14.8**

Notes: Earnings values are millions of dollars in year 2008 dollars. Jobs are full-time equivalent for one year.

Plant workers includes field technicians, administration and management. Non-plant workers includes jobs related to goods and services directly purchased by the plant. Economic impacts "During operating years" represent impacts that occur from plant operations / expenditures. The analysis does not include impacts associated with spending of plant "profits" and assumes no tax abatement.

TABLE 4.3-15
ECONOMIC BENEFITS RESULTS OF THE JEDI MODEL FOR OPERATION OF PHASES I AND II

During operating years (annual)	Jobs	Earnings
Direct Impacts	60	$2,400,000
Plant Workers Only	27	$1,500,000
Non-Plant Workers	33	$900,000
Indirect Impacts	16	$400,000
Induced Impacts	27	$600,000
Total Impacts (Direct, Indirect, Induced)	**103**	**$3,500,000**

Notes: Jobs are full-time equivalent for one year.

Plant workers includes field technicians, administration and management. Non-plant workers includes jobs related to goods and services directly purchased by the plant. Economic impacts "During operating years" represent impacts that occur from plant operations / expenditures. The analysis does not include impacts associated with spending of plant "profits" and assumes no tax abatement.

The costs of construction and annual operation are shown in **Table 4.3-16**. These costs are an indication of some of the revenue that would be generated by the project.

TABLE 4.3-16
CONSTRUCTION COST RESULTS OF THE JEDI MODEL FOR ALTERNATIVE A

Construction Costs	Cost
Materials	$35,058,451
Labor	$7,111,638
Construction Total	$42,170,089
Equipment Costs	
Turbines	$230,706,000
Blades	$76,902,000
Towers	$48,300,000
Equipment Total	$355,908,000
Other Costs	
HV Sub/Interconnection	$15,376,514
Engineering	$5,040,000
Legal Services	$390,600
Land Easements	$0
Site Certificate	$1,114,797
Other Subtotal	$21,921,911
Total Project Costs	**$420,000,000**

Land Values

Effects of Alternative A would be the same as for the No Action alternative.

Lease Payments

DNRC issues a land Use License for wind exploration. The fee for this license, in effect until the wind farm begins operating, is $1.50 per acre. The one-time construction fee is $1,500 per MW of installed capacity. The annual fees are calculated on gross revenues: 3% from start-up through year 10, 3.25% for years 11 through 15, and 3.5% from year 16 to termination of operations. The minimum annual fee is $2,500 per MW from start-up through year 15 and $2,800 per MW from year 16 through termination of operations (See **Table 4.3-17**). Because the actual annual MW that would be generated is unknown, and the number of turbines on state land could be from 7 to 15, the amounts in **Table 4.3-17** are based on the minimum dollar amounts for seven turbines.

TABLE 4.3-17
DNRC WIND FARM REVENUE (BASED ON SEVEN TURBINES)

	Construction	Start to Year 10	Years 11 to 15	Years 16 to End
Land Use License (3,080 acres at $1.50/acre– Ends at start-up)	$4,620			
One time Construction Fee ($1,500/MW)	$22,050			
Per Cent of Gross ($2,500/MW Minimum)		3% $36,750	3.25% $36,750	
Per Cent of Gross ($2,800/MW Minimum)				3.5% $41,160
Minimum Annual Totals	$25,497	$36,750	$36,750	$41,160

Assumptions:

Construction will be finished in one year
Land Use License is for 3,080 acres
Seven Turbines at 2.1 MW each, total of 14.7 MW
Gross revenue from turbines is unknown, Fees based on minimums

InvEnergy pays the Montana DNRC 2.7% of their annual revenue per turbine for the Judith Gap Wind Energy Center. For the 2007 operating year (January 2007 through February 2008) payment, 2.7% of the revenue generated by turbines on school trust land was $71,727.07 from 13 turbines. If the Martinsdale Wind Farm LLC average gross revenue were the same per turbine, the annual payment to the DNRC (for seven turbines) from start-up through year 10 would be $42,914; from year 11 through year 15 it would be $46,490; and from year 16 to the end of the project life it would be $50,066.

4.3.8.4 Cumulative Effects of Alternative A, Wind Turbines on State Land

Because there are no foreseeable future actions that would result in increased development in the area, no additional changes to economic impacts are anticipated at this time.

4.3.8.5 Alternative B, Easements on State Land

Contribution to the Local Tax Base

When Alternative B is completed, the JEDI model predicted that annual property taxes paid would be $944,067 (**Table 4.3-18**). Under Alternative B, 11 of the 119 turbines would be located in Meagher County and 108 would be located in Wheatland County. Based on a percentage, Meagher County turbines (9 percent) would generate $84,966 in annual property taxes, and Wheatland County turbines (91 percent) would generate $859,101 in annual property taxes. The increase in property taxes would be 2.3 percent in Meagher County, and 17 percent in Wheatland County.

TABLE 4.3-18
SELECTED OPERATION AND MAINTENANCE COST RESULTS OF THE JEDI MODEL FOR ALTERNATIVE B

Annual Operating and Maintenance Costs	Cost
Personnel	$1,312,560
Materials and Services	$2,257,440
Property Taxes*	$944,067

* This amount assumes no tax reductions are applied.

Tax relief under the No Action alternative may or not apply as described.

Boom and Bust Economy

The JEDI model showed full-time job creation due to construction of all three phases of 334 (**Table 4.3-18**), which, is and increase of 28 percent of total employment during construction for Wheatland County (estimated for 2008). During operation (2010 and later), 82 jobs would be created, an increase of 6.9 percent (**Table 4.3-19 and Table 4.3-20**).

TABLE 4.3-19
ECONOMIC BENEFITS RESULTS OF THE JEDI MODEL FOR CONSTRUCTION OF ALTERNATIVE B

During Construction Period	Jobs	Earnings ($ million)
Construction Sector Only	334	$11.3
Manufacturing Sector Only	7	$0.3
Other Industry Sectors	4	$0.1
Direct Impacts from Construction	**344**	**$11.7**

Notes: Earnings values are millions of dollars in year 2008 dollars. Jobs are full-time equivalent for one year.

Plant workers includes field technicians, administration and management. Non-plant workers includes jobs related to goods and services directly purchased by the plant. Economic impacts "During operating years" represent impacts that occur from plant operations / expenditures. The analysis does not include impacts associated with spending of plant "profits" and assumes no tax abatement.

TABLE 4.3-20
ECONOMIC BENEFITS RESULTS OF THE JEDI MODEL FOR OPERATION OF ALTERNATIVE B

During operating years (annual)	Jobs	Earnings
Direct Impacts	48	$1,900,000
Plant Workers Only	21	$1,200,000
Non-Plant Workers	26	$700,000
Indirect Impacts	13	$300,000
Induced Impacts	22	$500,000
Total Impacts (Direct, Indirect, Induced)	**82**	**$2,700,000**

Notes: Jobs are full-time equivalent for one year.

Plant workers includes field technicians, administration and management. Non-plant workers includes jobs related to goods and services directly purchased by the plant. Economic impacts "During operating years" represent impacts that occur from plant operations / expenditures. The analysis does not include impacts associated with spending of plant "profits" and assumes no tax abatement.

TABLE 4.3-21 CONSTRUCTION COST RESULTS OF THE JEDI MODEL FOR ALTERNATIVE B	
Construction Costs	**Cost**
Materials	$27,813,038
Labor	$5,641,899
Construction Total	$33,454,937
Equipment Costs	
Turbines	$183,026,760
Blades	$61,008,920
Towers	$38,318,000
Equipment Total	$282,353,680
Other Costs	
HV Sub/Interconnection	$12,198,701
Engineering	$3,998,400
Legal Services	$309,876
Land Easements	$0
Site Certificate	$884,406
Other Subtotal	$17,391,383
Total Project Costs	**$333,200,000**

Land Values

Effects of Alternative A would be the same as the No Action alternative.

Lease Payments

There would be no turbines on DNRC land under Alternative B, therefore, it would not generate anything for school endowments from wind turbines, but would generate approximately $400 per acre for easements ($5,216 for 13.04 acres).

4.3.8.6 Cumulative Effects of Alternative B, Easements on State Land

Because there are no foreseeable future actions that would result in increased development in the area, no additional changes to economic impacts are anticipated at this time.

4.3.9 Cultural Resources

4.3.9.1 No Action Alternative

Under this alternative no wind energy development would occur on state land and no direct or indirect impacts on NRHP eligible cultural resources would occur.

There is no legal obligation to conduct a cultural resource inventory on private land. However, if cultural resources are encountered, the Montana State Historic Preservation Office (SHPO) should be notified and the site avoided or properly documented.

4.3.9.2 Cumulative Effects of the No Action Alternative

Because there are no foreseeable future actions that would result in increased development in the area, no additional changes further impacting cultural resources are anticipated at this time.

4.3.9.3 Alternative A, Wind Turbines on State Land

Under this alternative, state land would be developed for the production of wind energy. A total of 126 turbines with associated access roads and underground electrical collection lines would be constructed on private and state land in the proposed project area. Previous cultural resource work has identified nine cultural resources; one irrigation ditch (24WL148) on state land, Highway 12 (24WL58) and three timber bridges along Highway 12 (24WL 84, 24WL85 and 24WL86), and four irrigation ditches on private land within the project area. Additionally, a project-specific cultural resource inventory will be conducted on state land when proposed project developments are finalized (Patrick Rennie, personal communication, June 12, 2008).

Site 24WL148 is located in Section 32, T9N, R12E, on state land. This site is the G. L. Mutual Ditch and it is recommended eligible to the NRHP under criteria A and B as the ditch and the individuals who built and operated it are part of the development of irrigation systems in Wheatland County. The ditch is not eligible under Criterion C as it does not contain structural or architectural features that could be considered unique or historically significant, nor is the ditch eligible under Criterion D as it does not contain cultural material important to history (Dau 1995b).

It is recommended that Site 24WL148 be avoided by construction activities associated with wind energy development. If this is not possible, the following measures are recommended to mitigate potential impacts. After construction activities, the ditch walls will be restored to a condition as near to original as possible. This can be done by refilling the ditch crossing with fill that matches the existing earthen ditch in color. This

impact would be low. The G. L. Mutual Ditch is a utilitarian feature that has experienced renovation activities in the past. Additionally, there is a large quantity of intact ditch mileage. The construction-related impacts would not be significant nor would they damage the qualities of the ditch that makes it eligible to the NRHP.

Highway 12 bisects the project area in Section18, T8N, R13E and sections 4, 5, 6, 11 and 13, T8N, R12E; and the three associated timber bridges are located in sections 5 and 6, T8N, R12E. The three bridges are not recommended eligible to the NRHP and eligibility has not been determined for Highway 12. These sites are owned by the Montana Department of Transportation. No impacts to Highway 12 are anticipated by wind energy construction activities.

The NRHP eligibility of the four irrigation ditches on private land has not been determined; however, there is no legal obligation to address cultural resources on private land. Although eligibility has not been determined, it is recommended that the ditches be avoided or restored to a near original condition if construction activities will disturb these sites.

If any cultural resources are identified on state land by the proposed project-specific inventory, these sites should be avoided during construction. If they cannot be avoided, appropriate levels of evaluation and mitigation would be required prior to wind energy construction. If any cultural resources are discovered during construction activities, work should be discontinued in the area and the DNRC archaeologist should be notified.

4.3.9.4 Cumulative Effects of Alternative A, Wind Turbines on State Land

Because there are no foreseeable future actions that would result in increased development in the area, no additional changes further impacting cultural resources are anticipated at this time.

4.3.9.5 Alternative B, Easements on State Land

Under this Alternative, no turbines would be built on state land. Martinsdale Wind Farm LLC would build 119 turbines on private land and the DNRC would grant easements for access roads and power lines on state land. Previous cultural resource work has identified nine cultural resources; one irrigation ditch (24WL148) on state land, Highway 12 (24WL58), three timber bridges along Highway 12 (24WL 84, 24WL85 and 24WL86), and four irrigation ditches on private land within the project area. Additionally, a project-specific cultural resource inventory will be conducted on state land when proposed project developments are finalized (Patrick Rennie, personal communication, June 12, 2008).

Site 24WL148 is located in Section 32, T9N, R12E, on state land. This site is the G. L. Mutual Ditch and it is recommended eligible to the NRHP under criteria A and B as the ditch and the individuals who built and operated it are part of the development of irrigation systems in Wheatland County. The ditch is not eligible under Criterion C as it does not contain structural or architectural features that could be considered unique or historically significant, nor is the ditch eligible under Criterion D as it does not contain cultural material important to history (Dau 1995b).

It is recommended that Site 24WL148 be avoided by construction activities associated with wind energy development. If this is not possible, the following measures are recommended to mitigate potential impacts. After construction activities, the ditch walls will be restored to a condition as near to original as possible. This can be done by refilling the ditch crossing with fill that matches the existing earthen ditch in color. This impact would be low. The G. L. Mutual Ditch is a utilitarian feature that has experienced renovation activities in the past. Additionally, there is a large quantity of intact ditch mileage. The construction-related impacts would not be significant nor would they damage the qualities of the ditch that makes it eligible to the NRHP.

Highway 12 bisects the project area in Section18, T8N, R13E and sections 4, 5, 6, 11 and 13, T8N, R12E; and the three associated timber bridges are located in sections 5 and 6, T8N, R12E. The three bridges are not recommended eligible to the NRHP and eligibility has not been determined for Highway 12. These sites are owned by the Montana Department of Transportation. No impacts to Highway 12 are anticipated by wind energy construction activities.

The NRHP eligibility of the four irrigation ditches on private land has not been determined; however, there is no legal obligation to address cultural resources on private land. Although eligibility has not been determined, it is recommended that the ditches be avoided or restored to a near original condition if construction activities will disturb these sites.

If any cultural resources are identified on state land by the proposed project-specific inventory, these sites should be avoided during construction. If they cannot be avoided, appropriate levels of evaluation and mitigation would be required prior to wind energy construction. If any cultural resources are discovered during construction activities, work should be discontinued in the area and the DNRC archaeologist should be notified.

4.3.9.6 Cumulative Effects of Alternative B, Easements on State Land

Because there are no foreseeable future actions that would result in increased development in the area, no additional changes further impacting cultural resources are anticipated at this time.

5.0 List of Agencies and Persons Consulted and/or Provided Copies of this EIS

Horizon Wind Energy
Van Jamison
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Meagher County Commission
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City of Harlowton
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Montana Department of Transportation
Montana Historical Society
Montana Department of Labor
United States Fish and Wildlife Service
United States Army Corp of Engineers, Helena
United States Bureau of Land Management, Billings
United States Forest Service, District Ranger
United States Federal Aviation Administration
United States Natural Resource Conservation Service
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APPENDIX A:
MARTINSDALE WILDLIFE ASSESSMENT

APPENDIX B:
VISUAL RESOURCES

APPENDIX C:
MONITORING PROTOCOL

APPENDIX D:
MITIGATION MEASURES

Appendix D
Mitigation Measures
(Alternative A, and B as appropriate)

Mitigation Measures for Wildlife

Turbines

- Implement a lighting scheme as required by FAA regulations. This could alert night migrants to the presence of turbines;

Power Lines **–** It is anticipated that all power lines would be buried. If any above-ground power lines are installed the following mitigations would be applied.

- Power lines will be buried, wherever possible;
- Minimize the use of guy wires, whenever possible;
- Use bird deflectors on power transmission lines;
- Install raptor perch prevention devices on aboveground power line poles;
- Avoid bird electrocution by placing sufficient space between power line wires;
- Take corrective actions as needed and as reviewed by a Wildlife Technical Advisory Committee;

General Wildlife

- Place turbines at least ½ mile from golden eagle nests;
- Establish and sign speed limits for all vehicles on roads;
- Restrict project vehicles to established roadways as much as practicable;
- All new fences built as part of the project should be wildlife friendly (smooth wire on top, minimum of 16 inches between ground and bottom wire) when landowner agrees;
- Work with landowner to reduce stress and cumulative adverse impacts to antelope through a voluntary program that might include removing and/or replacing portions of fence or leaving strategic openings in fences to allow easier passage for antelope if acceptable to the landowner and opportunities to make improvements arise;
- Minimize construction of new roads as much as feasible;

Habitat Loss/Degradation

- Plant only native vegetation at any disturbed site outside of cropland;
- Prevent or limit the spread of invasive weeds into the project area;
- Prevent or discourage new invaders (invasive weed species not previously reported from establishing in the project area; and,
- Cooperate with county and state agencies and adjacent private landowners interested in managing invasive weeds.
- Prior to entry of construction equipment on state land all construction equipment will be power washed to avoid transporting noxious weed seed onto state land.

Mitigation Measures for Visual Resources

The turbines should be painted with a flat gray or white, non-reflective paint. This color scheme would cause the wind turbines to appear to recede more quickly as viewing distance increases. To mitigate short-term visual resource impacts, vegetation disturbance and the number of cuts and fills for access roads should be minimized. The landscape should be reshaped to its original contour and disturbed areas should be promptly re-vegetated.